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The Preliminary Edition of the *NASA Thesaurus* (December 1967) (NASA SP-7030) is used as the authority for the indexing vocabulary that appears in the subject index. The *NASA Thesaurus* should be consulted in examining the current indexing vocabulary, including associated cross-reference structure. Only the subject terms that have been selected to describe the documents abstracted in this issue appear in the subject index. Copies of the *NASA Thesaurus* may be obtained from the National Technical Information Service or the U.S. Government Printing Office at $8.50 for the three-volume set. The first two volumes of this Thesaurus, consisting of the alphabetical listing of subject terms (A–Z), have been superseded by the following single-volume publication: *NASA Thesaurus Alphabetical Update* (September 1971) (NASA SP-7040), available from NTIS for $6.00. (Volume III of the Preliminary Edition consists of the following ancillary aids to vocabulary selection: hierarchical display of index terms, category term listing, permuted index, and a listing of postable terms only.)

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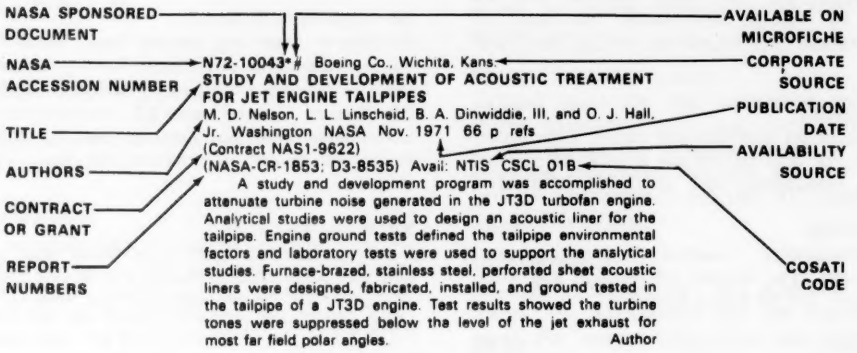
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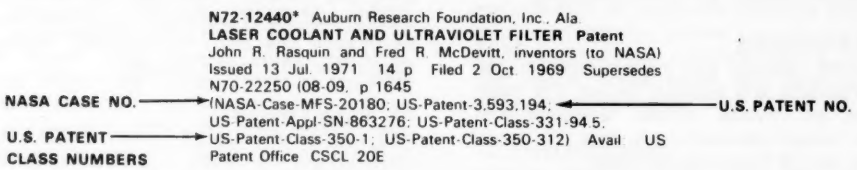
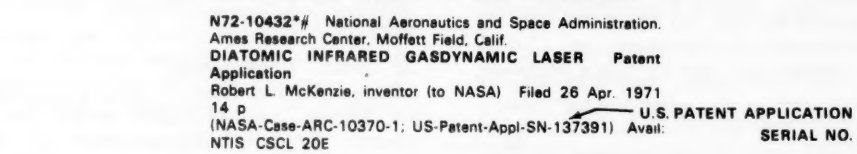
A study and development program was accomplished to attenuate turbine noise generated in the JT3D turbofan engine. Analytical studies were used to design an acoustic liner for the tailpipe. Engine ground tests defined the tailpipe environmental factors and laboratory tests were used to support the analytical studies. Furnace-brazed, stainless steel, perforated sheet acoustic liners were designed, fabricated, installed, and ground tested in the tailpipe of a JT3D engine. Test results showed the turbine tones were suppressed below the level of the jet exhaust for most far field polar angles. Author

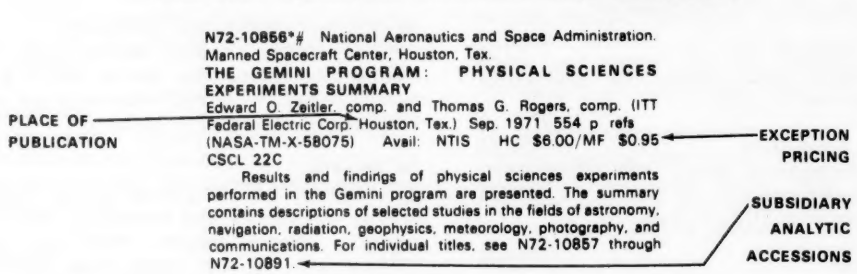
PATENT CITATION


N72-12440* Auburn Research Foundation, Inc., Ala
LASER COOLANT AND ULTRAVIOLET FILTER Patent
John R. Rasquin and Fred R. McDevitt, inventors (to NASA)
Issued 13 Jul. 1971 14 p Filed 2 Oct. 1969 Supersedes N70-22250 (08-09, p 1645
NASA CASE NO.
(NASA-Case-MFS-20180; US-Patent-3,593,194; US-Patent-Appl-SN-863276; US-Patent-Class-331-94.5;
U.S. PATENT NO.
U.S. PATENT CLASS NUMBERS
US-Patent-Class-350-1; US-Patent-Class-350-312) Avail: US Patent Office CSCL 20E

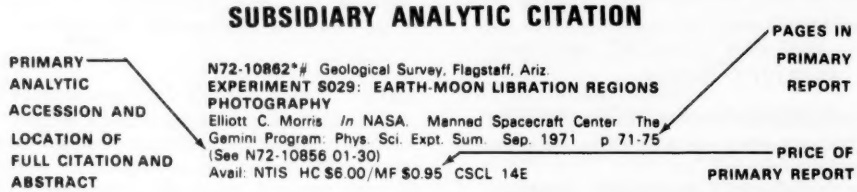
PATENT APPLICATION CITATION


N72-10432*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIATOMIC INFRARED GASDYNAMIC LASER Patent Application
Robert L. McKenzie, inventor (to NASA) Filed 26 Apr. 1971 14 p
U.S. PATENT APPLICATION SERIAL NO.
(NASA-Case-ARC-10370-1; US-Patent-Appl-SN-137391) Avail: NTIS CSCL 20E

PRIMARY ANALYTIC CITATION AND ABSTRACT


N72-10856*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
THE GEMINI PROGRAM: PHYSICAL SCIENCES EXPERIMENTS SUMMARY
Edward O. Zeitler, comp. and Thomas G. Rogers, comp. (ITT Federal Electric Corp., Houston, Tex.) Sep. 1971 554 p refs
PLACE OF PUBLICATION
(NASA-TM-X-58075) Avail: NTIS HC $6.00/MF $0.95
EXCEPTION PRICING
CSCL 22C
Results and findings of physical sciences experiments performed in the Gemini program are presented. The summary contains descriptions of selected studies in the fields of astronomy, navigation, radiation, geophysics, meteorology, photography, and communications. For individual titles, see N72-10857 through N72-10891.
SUBSIDIARY ANALYTIC ACCESSIONS

SUBSIDIARY ANALYTIC CITATION


PAGES IN PRIMARY REPORT
PRIMARY ANALYTIC ACCESSION AND LOCATION OF FULL CITATION AND ABSTRACT
N72-10862*# Geological Survey, Flagstaff, Ariz.
EXPERIMENT S029: EARTH-MOON LIBRATION REGIONS PHOTOGRAPHY
Elliott C. Morris In NASA. Manned Spacecraft Center The Gemini Program: Phys. Sci. Expt. Sum. Sep. 1971 p 71-75
(See N72-10856 01-30)
PRICE OF PRIMARY REPORT
Avail: NTIS HC $6.00/MF $0.95 CSCL 14E

VOLUME 10 NUMBER 24/ DECEMBER 23, 1972

Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbo machinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N72-32987 Engineering Sciences Data Unit, London (England).
PROFILE DRAG COEFFICIENT INCREMENT DUE TO FULL-SPAN SINGLE-SLOTTED FLAPS (HANDLEY PAGE AND NACA TYPES)
Aug. 1971 3 p refs
(ESDU-02.01.06) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The profile drag coefficient increment due to full span, single slotted flaps for the Handley Page and NACA type airfoils is plotted against flap angle for various ratios of flap chord/wing chord. The flap angle refers to the deflection of the flaps from the neutral position. The data refer to rectangular wings of aspect ratio 6 at an angle of incidence of 6 degrees above zero lift angle. The effect of aspect ratio different from 6 is considered negligible. Author

N72-32988 Engineering Sciences Data Unit, London (England).
LOW-SPEED NORMAL FORCE AND PITCHING MOMENT OF SLENDER WINGS IN GROUND EFFECT
Jun. 1971 10 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-71007) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The low speed normal force and pitching moment of slender wings in ground effect are discussed. The analysis applies to pointed slender wings with aspect ratio less than two with an unswept trailing edge, small amounts of camber or twist, and with separation along the whole of the leading edge. Curves from which the changes to normal force coefficient and the pitching moment coefficient can be calculated are presented. Author

N72-32989 Engineering Sciences Data Unit, London (England).
LOW-SPEED LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF SLENDER WINGS
Jun. 1971 14 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-71006) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The low speed longitudinal aerodynamic characteristics of slender wings are presented. The normal and axial force coefficients, the pitching moment coefficient, and the position of the aerodynamic center of uncambered, untwisted, pointed wings with unswept trailing edges and aspect ratio of two are analyzed. Mathematical models for determining the lift and drag coefficients are developed. Author

N72-32990 Engineering Sciences Data Unit, London (England).
LIFT COEFFICIENT INCREMENT DUE TO FULL-SPAN SPLIT FLAP: FLAP CHORD 0.20 c
Apr. 1971 2 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-01.01.04) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The determination of the lift coefficient increment due to full span split flap configurations is presented. The lift coefficient is plotted against flap angle for various thickness/chord ratios of the wings. The data refer to wings of aspect ratio 6 at an angle of incidence of degrees above the zero lift angle. It was determined that the lift coefficient increment does not depend on the wing section and is not sensitive to Reynolds number. Author

N72-32991*+ National Aeronautics and Space Administration, Washington, D.C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 20
Jul. 1972 137 p refs
(NASA-SP-7037(20)) Avail: NTIS HC $3.00 CSCL 01A

This special bibliography lists 437 reports, articles, and other documents introduced into the NASA scientific and technical information system in June 1972. Author

N72-32992# Cranfield Inst. of Technology (England). Dept. of Aerodynamics.
FLOW CHARACTERISTICS ABOUT A DELTA WING AT 15 DEG INCIDENCE WITH AND WITHOUT EDGE BLOWING
J. Spillman and M. Goodridge Apr. 1972 23 p refs Sponsored by Min. of Defence
(Cranfield-Aero-9) Avail: NTIS HC $3.25

Surface flow pictures and total head surveys have been taken to study how the flow about an uncambered, slender, delta wing at an incidence of 15 deg is changed by blowing high energy air from slots in the leading edge. The investigation was aimed at explaining why the increments of lift coefficient obtained with blowing were so much smaller than expected. It was found that in the region of the leading edge the blown air mixed with the free stream air to form spiral vortex sheets in which the total head varied from less than the free stream value in the cores to values considerably greater than that of the free stream in the mid-radius regions of the vortices. The general level of total head pressure in these vortices increased with increase in blowing momentum. Author

N72-32993*# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
COMPARISON OF AEROGRIDS AND PUNCHED PLATES FOR SMOOTHING FLOW FROM SHORT ANNULAR DIFFUSERS
R. L. Rumpf and W. B. Shippen 27 Jul. 1972 44 p refs
(NASA Order C-54545-B)
(NASA-CR-120960) Avail: NTIS HC $4.25 CSCL 01A

Scale model tests were conducted to evaluate the effectiveness of aerogrids and punched plates in producing flat velocity profiles downstream of short diffusers as would be used between the compressor and combustor of advanced aircraft engines. The diffuser had an area ratio of 4.17 and a length-to-inlet-height ratio of 2.07. The aerogrids tested were plates containing 1123 contoured venturis in parallel with geometric blockages of 83, 74, and 61 percent, respectively. The punched plates contained 1123 sharp-edged orifices with blockages of 58 and 30 percent. The results show that aerogrids, with higher effective blockage for the same pressure loss, are more effective flow-smoothing devices than the punched plates. Also, the overall pressure loss decreases and the exit velocity profile becomes flatter as either type of grid is moved closer to the diffuser exit plane. Author

N72-32994*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DRAG CHARACTERISTICS OF A DISK-GAP-BAND PARACHUTE WITH A NOMINAL DIAMETER OF 1.65 METERS AT MACH NUMBERS FROM 2.0 TO 3.0
Robert J. Mayhue and Percy J. Bobbitt Washington Oct. 1972 41 p refs
(NASA-TN-D-6894; L-8357) Avail: NTIS HC $3.00 CSCL 01A

Supersonic wind-tunnel tests were conducted with disk-gap-band parachute models having a nominal diameter of 1.65 meters and geometric porosities of 10.0, 12.5, and 15.0 percent. Canopy inflation characteristics, angles of attack, and drag performance are presented for deployment behind forebody base extensions which were free to oscillate in pitch and yaw. The effect of increasing suspension-line length on canopy motions and drag performance is included, and the drag performance of a model with 12.5 percent geometric porosity is compared with results from flight tests of a parachute with a nominal diameter of 12.19 meters. Author

N72-32995*# Rochester Applied Science Associates, Inc., N.Y.
MAIN ROTOR FREE WAKE GEOMETRY EFFECTS ON BLADE AIR LOADS AND RESPONSE FOR HELICOPTERS IN STEADY MANEUVERS. VOLUME 1: THEORETICAL FORMULATION AND ANALYSIS OF RESULTS
S. Gene Sadler Washington NASA Sep. 1972 109 p refs
(Contract NAS1-8448)
(NASA-CR-2110; RASA-71-13-Vol-1) Avail: NTIS HC $3.00 CSCL 01C

A mathematical model and computer program were implemented to study the main rotor free wake geometry effects on helicopter rotor blade air loads and response in steady maneuvers. The theoretical formulation and analysis of results are presented. Author

N72-32996*# Wichita State Univ., Kans. Dept. of Aeronautical Engineering.
EFFECTS OF LEADING-EDGE CAMBER ON LOW-SPEED CHARACTERISTICS OF SLENDER DELTA WINGS
W. H. Wentz, Jr. Washington NASA Oct. 1972 107 p refs
(Contract NAS1-10082)
(NASA-CR-2002) Avail: NTIS HC $3.00 CSCL 01A

Wind-tunnel studies have been conducted to determine the effects of leading-edge camber on the low-speed aerodynamic characteristics of a thin, sharp-edge 74 deg delta wing. The results include force and moment measurements, pressure distributions, and flow visualization patterns determined from oil flow, tuft and water vapor observations. The study indicated that leading-edge camber near the apex is effective in controlling the pitch-up tendency of slender delta wings. Author

N72-32997*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPLICATION OF THE LEADING EDGE SUCTION ANALOGY TO PREDICTION OF LONGITUDINAL LOAD DISTRIBUTION AND PITCHING MOMENTS FOR SHARP EDGED DELTA WINGS
Melvin H. Snyder, Jr. (Wichita State Univ.) and John E. Lamar Washington Oct. 1972 21 p refs
(NASA-TN-D-6994; L-8224) Avail: NTIS HC $3.00 CSCL 01A

The leading-edge-suction analogy of Polhamus has been used to develop the longitudinal load distribution of the vortex lift for delta wings. This distribution is shown to be similar in shape to that of the potential-flow longitudinal loading for delta wings having aspect ratios of 2 or less. The totals of the two theoretical distributions for delta wings with an aspect ratio near 1 are in good agreement with the experimentally determined loadings over the angle-of-attack range from 0 to 30 deg. The corresponding predicted pitching moments show slightly more stability than those measured, because of loss of lift near the wing tips. Author

N72-32998# Hydronautics, Inc., Laurel, Md.
ON THE AERODYNAMICS OF WAKE VORTICES
Clinton E. Brown May 1972 36 p refs
(Contract F44620-71-C-0080; AF Proj. 9781)
(AD-744860; TR-7115; AFOSR-72-1209TR) Avail: NTIS CSCL 01/2

The effect of wing span loading on the development of fully rolled up wing trailing vortices is discussed. It is shown that parabolic wing loadings produce potential flow maximum core rotary speeds which are finite and less than fifty percent of the downwash speeds at the plane of symmetry. The development of turbulent cores is analyzed and core growth is predicted. Axial flow effects of the wing profile drag and lifting system are shown to lead to axial jets on the vortex axis which may either follow the aircraft or exceed the free stream velocity depending on the ratio of profile drag to induced drag. GRA

N72-32999# Picatinny Arsenal, Dover, N.J.
SUBSONIC AERODYNAMIC STABILIZATION OF LONG LOW-DRAG BODIES OF REVOLUTION USING BOATTAIL FINS
Roy W. Kline Jun. 1972 68 p refs
(AD-744444; PA-TR-4307) Avail: NTIS

Subsonic three-degree-of-freedom wind tunnel tests were utilized to demonstrate the dynamic instability of a five and one half caliber long, spin stabilized body of revolution. A modification of this body, i.e., the addition of fins to the boattail section, is shown to be an effective means of controlling this instability. The optically acquired angular orientation data was fitted to a closed form solution of the differential equations of motion. The pitching, damping, and Magnus moments were evaluated as both linear and nonlinear functions of angle of attack. The airflow over the model was observed by means of smokeflow photography. Author (GRA)

N72-33000# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
PROJECTILE UNBALANCE
13 Jan. 1972 21 p refs
(AD-744822; TOP-4-2-801) Avail: NTIS CSCL 19/1

The reports describes dynamic and static methods of determining the amount of unbalance in projectiles. It includes mathematical computations. The dynamic method (using a balancing machine) provides both dynamic and static unbalance data. The static method (using a V-block and counterweight) yields only static unbalance data. Author (GRA)

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N72-33001 Engineering Sciences Data Unit, London (England).
FRICTIONAL AND RETARDING FORCES ON AIRCRAFT TYRES. PART 1: INTRODUCTION
Oct. 1971 42 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-71025-Pt-1) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The frictional and retarding forces that can be developed when aircraft tires are operated on prepared, hard runway surfaces are examined. The mechanisms for generating forces in the tire-ground contact area are described. Consideration is given to the effects on braking force of changes in tire, runway surface, and aircraft design operational factors. Mathematical models are included to amplify the theoretical aspects. Author

N72-33002 Engineering Sciences Data Unit, London (England).
AIRSPEED DATA FOR PERFORMANCE CALCULATIONS
Oct. 1969 34 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-69026) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Methods for obtaining airspeed and kinetic pressure information for application to aircraft performance estimation and data reduction purposes are presented. The data apply to pressure heights from minus 2,000 feet to 105,000 feet, Mach number from zero to 3, and ranges of equivalent airspeeds and calibrated airspeed up to 1,000 knots. Numerical representations and semi-graphical presentations of airspeed and kinetic pressure data are provided. The approach uses the basic relationships connecting parameters such as pitot pressure, ambient pressure, total temperature, and ambient temperature with airspeed and pressure height. Author

N72-33003 Engineering Sciences Data Unit, London (England).
NON-DIMENSIONAL APPROACH TO ENGINE THRUST AND AIRFRAME DRAG FOR THE ANALYSIS OF MEASURED PERFORMANCE DATA: AIRCRAFT WITH TURBO-JET AND TURBO-FAN ENGINES
Sep. 1970 10 p refs Supersedes ESDU-Perf-RJ-1/0 Sponsored by Roy. Aeron. Soc.
(ESDU-70020; ESDU-Perf-RJ-1/0) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A procedure is presented by which the engine and airframe characteristics used in the analysis and calculation of aircraft performance may be expressed in terms of a few compound parameters. The limitations of the method are discussed. Various additional factors which affect the analysis of measured performance are explained. The full theoretical treatment involves the derivation by dimensional analysis of nondimensional quantities relating to thrust, fuel flow, and drag. Author

N72-33004 Engineering Sciences Data Unit, London (England).
INTRODUCTION TO ITEMS ON THE ANALYSIS OF MEASURED PERFORMANCE DATA: AIRCRAFT WITH TURBO-JET AND TURBO-FAN ENGINES
Nov. 1970 7 p Sponsored by Roy. Aeron. Soc.
(ESDU-70019) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Procedures for reducing aircraft performance to compensate for atmospheric conditions and variations in aircraft configurations are presented. Information on the reduction of level speed data, climb data, range and endurance data, and take off and landing data is discussed. The performance characteristics of the engine and airframe are submitted as curves of various compound parameters and are suitable where a large number of points are available to establish the curves with a reasonable degree of accuracy. Author

N72-33005 Engineering Sciences Data Unit, London (England).
GRAPHICAL METHOD FOR THE ANALYSIS OF MEASURED PERFORMANCE DATA USING DRAG DETERMINATION: AIRCRAFT WITH TURBO-JET AND TURBO-FAN ENGINES
Sep. 1970 16 p Sponsored by Roy. Aeron. Soc.
(ESDU-70021) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A method of aircraft performance analysis used when drag is determined from a knowledge of thrust is presented. The performance characteristics of a subsonic interceptor aircraft with a fixed geometry engine without reheat are used as an example. Mathematical models are included to explain the conditions for level speed, fuel consumption, and minimum time to height. Author

N72-33006 Engineering Sciences Data Unit, London (England).
NON-DIMENSIONAL GRAPHICAL METHOD FOR THE ANALYSIS OF MEASUREMENTS OF STEADY LEVEL SPEED, RANGE AND ENDURANCE: AIRCRAFT WITH TURBOJET AND TURBOFAN ENGINES
Nov. 1970 12 p ref Supersedes ESDU-Perf-RJ-1/1 and ESDU-Perf-RJ-1/3 Sponsored by Roy. Aeron. Soc.
(ESDU-70022; ESDU-Perf-RJ-1/1; ESDU-Perf-RJ-1/3) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A nondimensional graphical method for analyzing measurements of level speed, range, and endurance of aircraft with turbojet and turbofan engines is presented. The method is applicable to aircraft operating at subsonic and supersonic speeds. The approach is to substitute expressions for thrust and drag in the force equation for steady level flight. Mathematical models, graphs, and table are provided to support the theoretical considerations. Author

N72-33007 Engineering Sciences Data Unit, London (England).
THE MEASUREMENT AND ANALYSIS OF CLIMB PERFORMANCE
Sep. 1970 16 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-70023) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Equations for determining the climb performance of aircraft are presented. The equations are based on the kinetic and potential energies of the aircraft of a given weight, flying at a definite airspeed, and prescribed altitude. Other relevant properties of the aircraft and engines are introduced by equating the rate of change of the total energy to the rate at which work is done on the aircraft by thrust and drag. Mathematical models and graphs are included to support the theoretical presentation. Author

N72-33008 Engineering Sciences Data Unit, London (England).
HEAT BALANCE FOR FLIGHT VEHICLES
Oct. 1969 12 p refs Supersedes ESDU-Aero-S.00.03.17 Sponsored by Roy. Aeron. Soc.
(ESDU-69009; ESDU-Aero-S.00.03.17) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Factors affecting skin temperature and heat transfer in high speed flight vehicles are outlined. Data are investigated with reference to structural design, structural strengths, and insulation requirements. E.H.W.

N72-33009 Engineering Sciences Data Unit, London (England).
THE ESTIMATION OF NEAR-FIELD SOUND PRESSURE LEVELS DUE TO JET NOISE
Jan. 1972 14 p refs Supersedes ESDU-67027 Sponsored by Roy. Aeron. Soc.
(ESDU-72002; ESDU-67027) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Methods for estimating the near field sound pressure levels created by jet noise are presented. The numerical calculation procedure is outined to show evaluation of the overall sound pressure level and the conversion of this level to a pressure loading. Corrections for local effects to improve the accuracy of the data are described. The theoretical considerations are supported by curves of the data. Author

N72-33010 Engineering Sciences Data Unit, London (England).
FRICTIONAL AND RETARDING FORCES ON AIRCRAFT TYRES. PART 3: PLANING
May 1972 22 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-72008-Pt-3) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Planing of aircraft tires on wet runways is discussed in terms of the observable characteristics and the mechanisms which produce it. Available data relating to planing are presented along with the application of these data for predicting and analyzing planing. F.O.S.

N72-33011*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COOPERATIVE PROGRAM FOR DESIGN, FABRICATION, AND TESTING OF GRAPHITE/EPOXY COMPOSITE HELICOPTER SHAFTING Progress Report
Charles C. Wright (Picatinny Arsenal), Donald J. Baker, N. Corvelli, L. Thurston, R. Clary, and W. Illg Oct. 1971 84 p Prepared in cooperation with Picatinny Arsenal
(NASA-TM-X-67739; AD-732866; PA-TR-4240) Avail: NTIS HC $6.25 CSCL 01C

The fabrication of UH-1 helicopter tail rotor drive shafts from graphite/epoxy composite materials is discussed. Procedures for eliminating wrinkles caused by lack of precure compaction are described. The development of the adhesive bond between aluminum end couplings and the composite tube is analyzed. Performance tests to validate the superiority of the composite materials are reported. Author

N72-33012# Cranfield Inst. of Technology (England).
AIRCRAFT DESIGN STUDIES: VERTICAL TAKE OFF AND LANDING AIRLINER
D. Howe May 1972 53 p refs
(Cranfield-Aero-10) Avail: NTIS HC $4.75

The aerodynamic configuration of a vertical takeoff transport aircraft with fan lift propulsion system is discussed. Specifications of the geometry, inertia, and aerodynamic characteristics are presented. The composition and performance of the propulsion system are analyzed. Tables of data are included to show dimensions and predicted performance. P.N.F.

N72-33013*# LTV Aerospace Corp., Hampton, Va. Technical Center.
AIRCRAFT SYSTEMS DESIGN STUDIES EMPLOYING ADVANCED TRANSPORT TECHNOLOGIES
B. Downie, C. Pearce, C. Quartero, and A. Taylor 5 Oct. 1972 49 p
(Contract NAS1-10900)
(NASA-CR-112181) Avail: NTIS HC $4.50 CSCL 01B

System and design integration studies are presented to define and assess the application of the advanced technology most likely to result in a superior next generation, high subsonic/sonic conventional takeoff and landing transport aircraft system. It is concluded that the new technologies can be directed toward the achievement of improved economy and performance. These benefits may be used to compensate for the penalties associated with reduced noise requirements anticipated to make future aircraft ecologically acceptable. Author

N72-33014*# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
ROTOR SYSTEMS RESEARCH AIRCRAFT OF PREDESIGN STUDY. VOLUME 1: SUMMARY AND CONCLUSIONS Final Report
Arthur W. Linden et al 6 Oct. 1972 28 p
(Contract NAS1-11228)
(NASA-CR-112152; SER-50775-Vol-1) Avail: NTIS HC $3.50 CSCL 01B

The results are summarized of a study to develop a versatile research aircraft for flight testing a wide variety of advanced helicopter and compound rotor systems. The aircraft is required to accept these rotors with minimal changes in the basic vehicle. Rotors envisioned for testing include conventional rotors plus variable geometry, variable twist, variable diameter, coaxial, jet flap, circulation control, and slowed rotors. Various disc loadings would be accommodated. The aircraft must be configured to measure performance more accurately than past test vehicles. In addition, the aircraft would have a wing to off load the rotor while measuring performance during lightly loaded conditions. It would have variable drag and propulsive force so that the rotor can be tested while producing different values of horizontal force. Author

N72-33015*# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
ROTOR SYSTEMS RESEARCH AIRCRAFT PREDESIGN STUDY. VOLUME 2: CONCEPTUAL STUDY REPORT Final Report
Steven A. Schmidt, Arthur W. Linden et al 6 Oct. 1972 68 p
(Contract NAS1-11228)
(NASA-CR-112153; SER-50775-Vol-2) Avail: NTIS HC $5.50 CSCL 01B

The overall feasibility of the technical requirements and concepts for a rotor system research aircraft (RSRA) was determined. The designs of two aircraft were then compared against the RSRA requirements. One of these is an all new aircraft specifically designed as an RSRA vehicle. A new main rotor, transmission, wings, and fuselage are included in this design. The second aircraft uses an existing Sikorsky S-61 main rotor, an S-61 roller gearbox, and a highly modified Sikorsky S-67 airframe. The wing for this aircraft is a new design. Both aircraft employ a fan-in-fin anti-torque/yaw control system, T58-GE-16 engines for rotor power, and TF34-GE-2 turbofans for auxiliary thrust. Each aircraft meets the basic requirements and goals of the program. The all new aircraft has inflight variable main rotor shaft tilt, a side-by-side cockpit seating arrangement, and is slightly faster in the compound mode. It is also somewhat lighter since it uses new dynamic components specifically designed for the RSRA. Preliminary development plans, including schedules and costs, were prepared for both of these aircraft. Author

N72-33016*# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
ROTOR SYSTEMS RESEARCH AIRCRAFT PREDESIGN STUDY. VOLUME 3: PREDESIGN REPORT Final Report
Steven A. Schmidt, Arthur W. Linden et al 6 Oct. 1972 186 p refs
(Contract NAS1-11228)
(NASA-CR-112154; SER-50775-Vol-3) Avail: NTIS HC $11.50 CSCL 01B

The features of two aircraft designs were selected to be included in the single RSRA configuration. A study was conducted for further preliminary design and a more detailed analysis of development plans and costs. An analysis was also made of foreseeable technical problems and risks, identification of parallel research which would reduce risks and/or add to the basic

capability of the aircraft, and a draft aircraft specification.
Author

N72-33017*# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
ROTOR SYSTEMS RESEARCH AIRCRAFT PREDESIGN STUDY. VOLUME 4: PRELIMINARY DRAFT DETAIL SPECIFICATION Final Report
Alfred N. Miller, Arthur W. Linden et al 6 Oct. 1972 83 p
(Contract NAS1-11228)
(NASA-CR-112155; SER-50775-Vol-4) Avail: NTIS HC $6.25 CSCL 01B

The RSRA requirements are presented in a detail specification format. Coverage of the requirements includes the following headings: (1) aircraft characteristics, (2) general features of design and construction, (3) aerodynamics, (4) structural design criteria, (5) flight control system, (6) propulsion subsystem, and (7) secondary power and distribution subsystem. D.L.G.

N72-33018*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPERIMENTAL INVESTIGATION OF AN ACCELEROMETER CONTROLLED AUTOMATIC BRAKING SYSTEM
Robert C. Dreher, Robert K. Sleeper, and John R. Nayadley, Sr. Washington Oct. 1972 31 p refs
(NASA-TN-D-6953; L-8108) Avail: NTIS HC $3.00 CSCL 01B

An investigation was made to determine the feasibility of an automatic braking system for arresting the motion of an airplane by sensing and controlling braked wheel decelerations. The system was tested on a rotating drum dynamometer by using an automotive tire, wheel, and disk-brake assembly under conditions which included two tire loadings, wet and dry surfaces, and a range of ground speeds up to 70 knots. The controlling parameters were the rates at which brake pressure was applied and released and the Command Deceleration Level which governed the wheel deceleration by controlling the brake operation. Limited tests were also made with the automatic braking system installed on a ground vehicle in an effort to provide a more realistic proof of its feasibility. The results of this investigation indicate that a braking system which utilizes wheel decelerations as the control variable to restrict tire slip is feasible and capable of adapting to rapidly changing surface conditions.
Author

N72-33019*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
FLIGHT INVESTIGATION OF THE ROLL REQUIREMENTS FOR TRANSPORT AIRPLANES IN THE LANDING APPROACH
Euclid C. Holleman and Bruce G. Powers Washington Oct. 1972 49 p refs
(NASA-TN-D-7062; H-711) Avail: NTIS HC $3.00 CSCL 01B

An in-flight evaluation of transport roll characteristics in the landing approach was made with a general purpose airborne simulator. The evaluation task consisted of an instrument approach with a visual correction for a (200-foot) lateral offset. Pilot evaluations and ratings were obtained for approaches made at 140 knots and 180 knots indicated airspeed with variations of wheel characteristics, maximum roll rate, and roll time constant.
Author

N72-33020*# Bell Helicopter Co., Fort Worth, Tex.
PREDESIGN REPORT FOR THE ROTOR SYSTEMS RESEARCH AIRCRAFT
1972 83 p refs
(Contract NAS1-11251)
(NASA-CR-112156) Avail: NTIS HC $6.25 CSCL 01C

A conceptual predesign of a compound helicopter for conducting rotor research is presented. The aircraft was selected by the Government as the better of two concepts submitted. The helicopter is a three place vehicle in the 24,000 pound gross weight class. It has been determined that the helicopter satisfies the requirements for the rotor research mission. The model has been predesigned sufficiently to allow an assessment of its performance and stability and control characteristics. A brief treatment of these subjects is included.
Author

N72-33021*# Bell Helicopter Co., Fort Worth, Tex.
A CONCEPTUAL STUDY OF THE ROTOR SYSTEMS RESEARCH AIRCRAFT
1972 197 p refs
(Contract NAS1-11251)
(NASA-CR-112157) Avail: NTIS HC $12.00 CSCL 01C

The analytical comparison of the two candidate Rotor Systems Research Aircraft (RSRA) configurations selected by the Government at the completion of Part 1 of the RSRA Conceptual Predesign Study is presented. The purpose of the comparison was to determine the relative suitability of both vehicles for the RSRA missions described in the Government Statement of Work, and to assess their versatility in the testing of new rotor concepts. The analytical comparison was performed primarily with regard to performance and stability and control. A weights, center-of-gravity, and inertia computation was performed for each iteration in the analysis process. The dynamics investigation was not concerned so much with a comparison of the two vehicles, but explored the dynamic problems attending operation of any RSRA operating with large rotor RPM and diameter ranges over large forward speed ranges. Several means of isolating in- and out-of-plane rotor vibrations were analyzed. An optimum isolation scheme was selected.
Author

N72-33022# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT, TANDY, CORPORATION, GATES LEARJET MODEL 25 N658TC NEAR THE VICTORIA COUNT-FOSTER AIRPORT, VICTORIA, TEXAS, 18 JANUARY 1972
9 Aug. 1972 14 p
(NTSB-AAR-72-24) Avail: NTIS HC $3.00; National Transportation Safety Board, Administrative Operations Div., Accident Inquiries and Records Section, Washington, D. C. 20591

A Learjet Model 25 crashed on January 18, 1972 during a nonprecision instrument approach to the Victoria County-Foster Airport, Victoria, Texas. The probable cause of the accident was the lack of altitude awareness on the part of the flight crew while descending into known weather conditions which were conducive to a rapid deterioration in forward visibility.
Author

N72-33023*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF PICTORIAL DISPLAY CONFIGURATION ON THE FREQUENCY OF CONTROL REVERSALS DURING AIRCRAFT LANDING APPROACHES
R. Lincoln (DeAnza Coll.), E. A. Palmer, and T. Wempe Oct. 1972 18 p refs
(NASA-TM-X-62191) Avail: NTIS HC $3.00 CSCL 01B

A fixed-base simulator study to determine the effect of increased pictorial display realism on the frequency of control reversals made with an inside-out landing display was conducted. Display conditions included the effects of collimation and scale (head-up versus head-down presentation), horizon symbology (simple line versus white-black sky-ground surfaces), and ground plane realism (computer generated perspective versus a TV picture of a realistic model). The number of control reversals was moderately high on all displays. Control reversals to roll disturbances occurred nearly twice as frequently as reversals to either pitch or lateral rate disturbances. Though there were no significant differences among the numbers of small control reversals for the different displays, there was some evidence that this conclusion may not apply to large control reversals.
Author

N72-33024*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NIGHT VISUAL APPROACHES: PILOT PERFORMANCE

WITH AND WITHOUT A HEAD-UP DISPLAY
Everett A. Palmer Oct. 1972 23 p refs
(NASA-TM-X-62188) Avail: NTIS HC $3.25 CSCL 01B

Simulated night visual approaches were flown into two airports with and without a head up display (HUD) in a transport aircraft. The HUD featured pitch stabilized vertical scales which displayed the glide slope angle to the runway aim point and a horizontal bar which aided the pilot in his control of the aircraft flight path angle. One airport was located on flat terrain with numerous foreground lights, the second airport had no foreground lights and the terrain sloped up behind the airport. With the HUD glide slope tracking precision was equally good for either runway. With no HUD glide slope tracking was about three times worse with the flat airport and about eight times worse with the airport with no foreground lights and up-sloping terrain beyond the runway. Author

N72-33025*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HYPERSONIC TRANSPORTS: ECONOMICS AND ENVIRONMENTAL EFFECTS
R. H. Petersen and M. H. Waters Oct. 1972 13 p refs
(NASA-TM-X-62193) Avail: NTIS HC $3.00 CSCL 01B

An economic analysis of hypersonic transports is presented to show projected operating costs (direct and indirect) and return on investment. Important assumptions are varied to determine the probable range of values for operating costs and return on investment. The environmental effects of hypersonic transports are discussed and compared to current supersonic transports. Estimates of sideline and fly-over noise are made for a typical hypersonic transport, and the sonic boom problem is analyzed and discussed. Since the exhaust products from liquid hydrogen-fueled engines differ from those of kerosene-fueled aircraft, a qualitative assessment of air pollution effects is made. Author

N72-33026*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A VTOL TRANSLATIONAL RATE CONTROL SYSTEM STUDY ON A SIX DEGREES-OF-FREEDOM MOTION SIMULATOR
Lloyd D. Corliss and Daniel C. Dugan Oct. 1972 27 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-62194) Avail: NTIS HC $3.50 CSCL 01B

A linearized translational rate system for near hover flight was optimized on a large motion simulator under the constraints of no disturbances and limited control power. Both lateral and longitudinal modes were considered with the primary variables of investigation being control sensitivity and response stiffness and secondarily system damping. Yaw and height control characteristics were represented by an angular rate and acceleration system, respectively. General regions of desired sensitivity and stiffness for the longitudinal and lateral modes were determined under VFR conditions for both the rapid maneuver task and the station keeping/mild maneuver task. Author

N72-33027*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HELICOPTER PAYLOAD GAINS UTILIZING WATER INJECTION FOR HOT DAY POWER AUGMENTATION
Robert H. Stroub Oct. 1972 17 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-62195) Avail: NTIS HC $3.00 CSCL 01B

An analytical investigation was undertaken to assess the gains in helicopter mission payload through the use of water injection to produce power augmentation in an altitude-hot day environment. Substantial gains are shown for two representative helicopters, the UH-1H and CH-47B. The UH-1H payload increased 86.7 percent for a 50 n.mi. (92.6 km) radius mission involving two out-of-ground effect (OGE) hover take-offs of 2 minutes each at 5000 ft. (1525 m) 35 C ambient conditions. The CH-47B payload increased 49.5 percent for a 50 n.mi. (92.6 km) radius mission with sling loaded cargo as the outbound payload and a 3000 lb. (1360 kg) internal cargo on the return leg. The mission included two 4 min. OGE hovers at 6000 ft. (1830 m) 35 C. An improvement in take off performance and maximum performance climb also resulted as a consequence of the OGE hover capability and higher maximum power available. Author

N72-33028*# Aerospace Corp., El Segundo, Calif.
STUDY OF LOW DENSITY AIR TRANSPORTATION CONCEPTS
H. M. Webb Washington NASA Oct. 1972 57 p refs
(Contract NAS2-6473)
(NASA-CR-2142) Avail: NTIS HC $3.00 CSCL 01B

Low density air transport refers to air service to sparsely populated regions. There are two major objectives. The first is to examine those characteristics of sparsely populated areas which pertain to air transportation. This involves determination of geographical, commercial and population trends, as well as those traveler characteristics which affect the viability of air transport in the region. The second objective is to analyze the technical, economic and operational characteristics of low density air service. Two representative, but diverse areas, West Virginia and Arizona, were selected for analysis: The results indicate that Arizona can support air service under certain assumptions whereas West Virginia cannot. Author

N72-33029*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
NOISE FROM INTERACTION OF FLOW WITH RIGID SURFACES: A REVIEW OF CURRENT STATUS OF PREDICTION TECHNIQUES
Richard E. Hayden Washington NASA Oct. 1972 65 p refs
(Contract NAS1-9559-14)
(NASA-CR-2126; BBN-2276) Avail: NTIS HC $3.00 CSCL 20D

A brief review of some fundamental aspects of sound arising from turbulent boundary layers, noise due to flow past a single discontinuity (trailing edge), noise from airfoils operating in turbulent flow, and noise due to rigid flow discontinuities (spoilers) immersed in rigid ducts is presented. Emphasis is on dipole-like sound fields associated with turbulent flow past a trailing edge, rigid bodies in turbulence and in-duct spoilers. Representative available data are reviewed and evaluated in terms of theoretical considerations and, where possible, empirical prediction techniques are given in terms of convenient aerodynamic and geometric parameters. Limitations on current knowledge are discussed. Author

N72-33030*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FIXED BASE SIMULATOR STUDY OF AN EXTERNALLY BLOWN FLAP STOL TRANSPORT AIRPLANE DURING APPROACH AND LANDING
William D. Grantham, Luat T. Nguyen, James M. Patton, Jr., Perry L. Deal, Robert A. Champine, and C. Robert Carter (Army Air Mobility R and D Lab.) Washington Oct. 1972 98 p refs
(NASA-TN-D-6898; L-8394) Avail: NTIS HC $3.00 CSCL 01B

A fixed-base simulator study was conducted to determine the flight characteristics of a representative STOL transport having a high wing and equipped with an external-flow jet flap in combination with four high-bypass-ratio fan-jet engines during the approach and landing. Real-time digital simulation techniques were used. The computer was programed with equations of motion for six degrees of freedom and the aerodynamic inputs were based on measured wind-tunnel data. A visual display of a STOL airport was provided for simulation of the flare and touchdown characteristics. The primary piloting task was an instrument approach to a breakout at a 200-ft ceiling with a visual landing. Author

N72-33031*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INSTALLATION EFFECTS ON PERFORMANCE OF MULTIPLE MODEL V/STOL LIFT FANS
J. H. Diedrich, N. Clough, and S. Lieblein 1972 15 p refs Proposed for Presentation at the 8th Propulsion Specialists Conf., New Orleans, 29 Nov. - 1 Dec. 1972; sponsored by AIAA and Soc. of Automotive Engr.
(NASA-TM-X-68138; E-7139) Avail: NTIS HC $3.00 CSCL 01B

An experimental program was performed in which the individual performance of multiple VTOL model lift fans was measured. The model tested consisted of three 5.5 in. diameter tip-turbine driven model VTOL lift fans mounted chordwise in a two-dimensional wing to simulate a pod-type array. The performance data provided significant insight into possible thrust variations and losses caused by the presence of cover doors, adjacent fuselage panels, and adjacent fans. The effect of a partial loss of drive air supply (simulated gas generator failure) on fan performance was also investigated. The results of the tests demonstrated that lift fan installation variables and hardware can have a significant effect on the thrust of the individual fans.
Author

N72-33032# Royal Aircraft Establishment, Farnborough (England).
DEVELOPMENT OF AN ICE-SHEDDING COATING FOR HELICOPTER ROTOR BLADES
J. H. Sewell Dec. 1971 25 p refs
(RAE-TR-71238; BR-28616) Avail: NTIS HC $3.25

The adhesion of ice to a low energy surface film on a rigid base is greatly reduced when a flexible sponge rubber substrate is present between the surface and the base. An inexpensive coating based on readily available materials which shows promise of improving the ice-shedding characteristics of helicopter rotor blades has been proposed for practical trials; it is capable of further development to obtain optimum properties.
Author (ESRO)

N72-33033# Defense Documentation Center, Alexandria, Va.
VERTICAL TAKE-OFF PLANES Bibliography Report, Jan. 1962 - Jan. 1972
Jun. 1972 271 p refs Supersedes DDC-TAS-68-64
(AD-744000; DDC-TAS-72-46) Avail: NTIS CSCL 01/3

References in this bibliography relate to design, configurations, flight testing, flight control systems, model tests, lift fans, shrouded propellers, rotary wings, aerodynamic characteristics, propulsion systems, performance engineering, capabilities and effectiveness of the Vertical Take-Off Planes. Computer generated indexes are included.
Author (GRA)

N72-33034# Naval Air Propulsion Test Center, Philadelphia, Pa. Aeronautical Engine Dept.
ROTOR BURST PROTECTION PROGRAM. PHASES 6 AND 7: EXPLORATORY EXPERIMENTATION TO PROVIDE DATA FOR THE DESIGN OF ROTOR BURST FRAGMENT CONTAINMENT RINGS
Mar. 1972 48 p refs
(AD-744950; NAPTC-AED-1968) Avail: NTIS CSCL 01/3

Presented are the results of exploratory experimentation that was conducted in NAPTC Rotor Spin Facility to provide criteria for the design of turbomachine rotor burst fragment containment rings. High-speed photography was used to study containment processes involving freely supported rings of different materials and a variety of rotor and flat disk fragments.
Author (GRA)

N72-33035# Cornell Aeronautical Lab., Inc., Buffalo, N.Y. Flight Research Dept.
IN-FLIGHT INVESTIGATION OF AN UNAUGMENTED CLASS 3 AIRCRAFT IN THE LANDING APPROACH TASK, PHASE 1: LATERAL-DIRECTIONAL STUDY
Richard Wasserman, Franklin F. Eckhart, and Howard J. Ledder Wright-Patterson AFB, Ohio AFFDL Jan. 1972 273 p refs
(Contract F33615-71-C-1110; AF Proj. 6848)
(AD-744831; CAL-TB-3020-F-2; AFFDL-TR-71-164-Vol-1) Avail: NTIS CSCL 14/2

An in-flight research program on the handling qualities of Class III airplanes in the landing approach was conducted using the USAF/CAL Total In-Flight Simulator (TIFS) airplane. The Phase I research program discussed in the report consisted of an investigation of lateral-directional handling qualities. A baseline configuration was defined by a set of stability and control derivatives provided by the Air Force. The experiment was based on the evaluation of this configuration and other configurations defined by changes in stability and control derivatives from the baseline values. Seventeen different configurations were evaluated utilizing 3 different pilots. A total of thirty six evaluations was performed.
GRA

N72-33036# Piasecki Aircraft Corp., Philadelphia, Pa.
MULTI-HELICOPTER HEAVY LIFT SYSTEM FEASIBILITY STUDY Final Engineering Report
Kazimierz Korsak, Kenneth R. Meenen, Donald N. Meyers, and Frank N. Piasecki Feb. 1972 178 p refs
(Contract N62269-71-C-0581)
(AD-743516; Rept-39-X-11) Avail: NTIS CSCL 01/3

A tandem nose-to-tail configuration was selected, and a detailed study of the configuration was made to assess its feasibility and identify potential problem areas. A feasible heavy-lift vehicle is postulated with a predicted payload capability up to 18.7 tons which is recommended to be carried forward to flight evaluation.
Author (GRA)

N72-33037# ARO, Inc., Arnold Air Force Station, Tenn.
DEPLOYMENT AND PERFORMANCE CHARACTERISTICS OF ATTACHED INFLATABLE DECELERATORS WITH MECHANICALLY DEPLOYED INLETS AT MACH NUMBERS FROM 2.6 TO 4.5 Final Report
David E. A. Reichenau AEDC Jun. 1972 31 p refs
(Contract F40600-72-C-0003)
(AD-743303; AEDC-TR-72-90; ARO-PWT-TR-71-119) Avail: NTIS CSCL 01/3

A test was conducted in the wind tunnel to determine deployment, inflation, and steady-state characteristics of attached inflatable decelerators. Deployments were made at a Mach number of 3.0 at a free-stream dynamic pressure of 120 psf. The mechanically deployed inlet system resulted in successful deployments of the five test models with rapid inflation times of approximately 0.2 sec. The attached decelerators were stable throughout the Mach number range from 2.6 to 4.5 and at angles of attack through 10 deg.
Author (GRA)

N72-33038# Naval Postgraduate School, Monterey, Calif.
A PARAMETER OPTIMIZATION APPROACH TO AIRCRAFT GUST ALLEVIATION M.S. Thesis
Russell Lee Clement Mar. 1972 64 p refs
(AD-743722) Avail: NTIS CSCL 01/4

The report indicates that a knowledge of angle of attack (alpha) and/or gust perturbation angle of attack (alpha sub g) is of prime importance for a longitudinal autopilot designed to alleviate the effect of vertical gusts. However, accurate measurement of alpha and alpha sub g is extremely difficult. This research indicates that the readily measurable normal acceleration factor (n) and pitch rate (q) can be used to provide alpha and alpha sub g information indirectly.
Author (GRA)

N72-33039# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
INVESTIGATION OF THE SPEED BRAKES ON THE S-67 AIRCRAFT Final Report
N. F. K. Kefford Apr. 1972 59 p refs
(Contract DAAJ02-71-C-0009)
(AD-745214; SER-67007; USAAMRDL-TR-72-22) Avail: NTIS

CSCL 01/3

Flight tests and computer simulations to evaluate speed brakes for a winged helicopter were conducted. The flight test program established the effectiveness of wing-mounted speed brakes for increasing dive angle, deceleration capability, and maneuverability of the Sikorsky S-67. In the configuration tested, six brake surfaces operated together to increase aircraft drag by 155% while reducing wing lift. With these speed brakes, dive angles could be increased from 5 to 7 degrees at 140 knots dependent upon the initial dive angle. At 160 knots, the increase in dive angle varies from 8 to 9 degrees. These increases in aircraft dive angle due to speed brake extension can be further increased by allowing the aircraft to accelerate during the dive. Dive characteristics with and without speed brakes extended were obtained. A dive envelope defined by control and airframe stress limits was established that provided a broad dive envelope of forward speed and collective settings to achieve various dive angles. Author (GRA)

N72-33040# American Airlines, Inc., New York.
AIRLINE VIEW OF STOL SYSTEM REQUIREMENTS Final Report
Feb. 1972 22 p refs
(AD-745283; AAL-ER/D-56-Summary; DOT-OS-10075-Summary) Avail: NTIS CSCL 01/3

Conventional air and rail systems are incapable of providing needed short-haul service for the increased capacity requirements of the near future. Some improvements can be made but a new, integrated short-haul transportation system may be needed to supplement the present system. The complexity and magnitude of the problem require significant leadership and funding by the Federal Government. The airlines' areas of concern include the aircraft, STOLports, ATC, marketing, safety, economics, and acceptance by passengers and STOLport neighbors. The paper addresses reduced takeoff and landing (RTOL), propeller STOL transport (PST), jet STOL transport (JST), ATC, STOLport siting, route analysis, certification and safety, airline service requirements, economics, Metroflight demonstration need, STOLport acceptance, public demand stimulation and STOL development system management. Its purpose is to document an airline's views on as many STOL system implementation factors as possible at this time to provide for STOL system planners. Author (GRA)

N72-33041# Army Materials and Mechanics Research Center, Watertown, Mass.
THE HELICOPTER ROTOR
Chintakindi V. Joga Rao Dec. 1971 61 p refs
(DA Proj. 1T0-61102-B-33-A)
(AD-745124; AMMRC-MS-71-3) Avail: NTIS CSCL 01/3

Emergence of the present configurations of helicopter rotors is briefly described. Some of the highlights of operational experience on pure helicopters and compounds have been presented. Characteristics of various types of rotors have been described followed by recent rotor developments and concepts. Rotor airloads and aeroelastic instabilities receive some attention. The need for further research on airloads, certain aspects of aeroelasticity and gust loads is brought out. The Appendix deals with rotor interactions on the fuselage. The emphasis throughout is on aircraft structures, vibrations, and related areas. Considerable attention has been focused on the hingeless rotor in view of current interest. Author (GRA)

N72-33042# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT: UNITED AIR LINES, INC., BOEING 737-222, N9005U, PHILADELPHIA INTERNATIONAL AIRPORT, PHILADELPHIA, PENNSYLVANIA, 19 JULY 1971
29 Dec. 1971 42 p
(PB-208664; NTSB-AAR-72-9) Avail: NTIS HC $3.00 CSCL 01B

On 19 July 1970 a Boeing 737-222, crashed shortly after taking off from the Philadelphia International Airport, Philadelphia, Pennsylvania. There were no fatalities. Among 55 passengers and six crewmembers, 17 passengers were injured, one seriously, and one crewmember received minor injuries. Examination of the left (No. 1) engine revealed that a first-stage turbine blade failed. Disassembly of the right (No. 2) engine and functional testing of its components revealed that the engine was operating in the air, during the thrust reversing cycle, and until the engine impacted the ground. The probable cause of this accident was the termination of the takeoff, after the No. 1 engine failed, at a speed above V2 at a height of approximately 50 feet, with insufficient runway remaining to effect a safe landing. Author (GRA)

N72-33043# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT: FLYING TIGER LINE, INC., DOUGLAS DC-8-63F, N785FT, NAHA AIR BASE, OKINAWA, RYUKYU ISLANDS, 27 JULY 1970
29 Dec. 1971 50 p
(PB-208767; NTSB-AAR-72-10) Avail: NTIS HC $3.00 CSCL 01B

While in the process of executing a precision radar GCA, a DC-8-63F cargo aircraft, crashed about 2,200 feet short of the threshold of Runway 18 at Naha Air Base, July 27, 1970. The four crewmembers and only occupants died as a result of the accident. The weather conditions at Naha were good with scattered rain showers, one of which was located in the vicinity of the GCA minimum altitude position. Bright areas of sunlight existed where cloud cover was absent. The probable cause of this accident was an unarrested rate of descent due to inattention of the crew to instrument altitude references while the pilot was attempting to establish outside visual contact in meteorological conditions which precluded such contact during that segment of a precision radar approach inbound from the Decision Height. Author (GRA)

N72-33044# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT: TRANS CARIBBEAN AIRWAYS, INC., BOEING 727-200, CHARLOTTE AMALIE, ST. THOMAS, VIRGIN ISLANDS, 28 DECEMBER 1970
29 Dec. 1971 56 p refs
(PB-208675; NTSB-AAR-72-8) Avail: NTIS HC $3.00 CSCL 01B

Trans Caribbean Airways Flight 505 crashed during an attempted landing, at Harry S. Truman Airport, St. Thomas, U.S. Virgin Islands. Forty-six of the 48 passengers and the entire crew of seven survived the accident and the ensuing ground fire. The flight was routine until the attempted landing. At that time, the aircraft touched down hard, bounced twice, departed the airport property, and came to rest on the slope of a nearby hill. GRA

N72-33045# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.
AIRCRAFT ACCIDENT REPORTS, BRIEF FORMAT. U.S. CIVIL AVIATION. ISSUE NO. 3, 1970 ACCIDENTS
29 Nov. 1971 499 p
(PB-210121; NTSB-BA-71-4) Avail: NTIS HC $6.00 CSCL 01B

The publication contains selected aircraft accident reports, in brief format, occurring in U.S. Civil Aviation operations during calendar year 1970. The 898 General Aviation accidents contained in this publication represent a random selection. This publication is issued irregularly, normally six times each year. The brief format presents the facts, conditions, circumstances, and probable cause(s) for each accident. Additional statistical information is tabulated by type of accident, phase of operation, kind of flying, injury index, aircraft damage, conditions of light, pilot certificate, injuries, and causal factors. Author (GRA)

N72-33046# Whittaker Corp., San Diego, Calif. Research and Development Div.
FILAMENT COMPOSITE WHEEL DEVELOPMENT FOR MILITARY AIRCRAFT Final Report, 22 Oct. 1970 - 13 Aug. 1971
Audie L. Price Wright-Patterson AFB, Ohio AFFDL Oct. 1971 49 p
(Contract F33615-71-C-1089; AF Proj. 1369)
(AD-745130; MJO-3025; AFFDL-TR-71-144) Avail: NTIS CSCL 01/3

A program was conducted wherein a fibrous graphite/epoxy aircraft wheel was designed, fabricated and delivered to the Air Force for testing. The composite wheel was fabricated using continuous fibers laid up on a male mold with multiple autoclave staging. The material was applied in broadgood patterns by hand and in continuous forms by filament winding. The completed layup was machined to proper configuration. Author (GRA)

N72-33047# Army Electronics Command, Fort Monmouth, N.J. Avionics Lab.
SIMULATION OF THE INDUCED FLOW THROUGH A ROTOR IN DESCENDING FLIGHT
N. K. Shupe Jun. 1972 31 p refs
(DA Proj. 1F1-62202-A-219)
(AD-745103; ECOM-3579) Avail: NTIS CSCL 01/2

The report outlines an emperical modification to classified momentum theory for the modeling of the induced flow through a rotor in descending flight. Consideration is also given to the computational stability of the procedure with emphasis upon the real-time representation of the system within a digital computer. Author (GRA)

N72-33048# Army Electronics Command, Fort Monmouth, N.J.
CONTROLLED HELICOPTER DISCHARGE
Rudolf G. Buser, Helmuth M. Kaunzinger, and Irwin Gumeiner May 1972 38 p refs
(DA Proj. 1T0-61102-B-31-A)
(AD-745102; ECOM-3575) Avail: NTIS CSCL 09/1

Several new approaches, potentially capable of discharging a helicopter to an operationally safe potential against ground, have been explored. Specifically, water spray discharges have been studied under various conditions and appear promising. Other elements of a complete active discharge system, namely, field sensor and information processor/indicator, have been developed and tested also, as well as the complete system itself. Author (GRA)

N72-33049# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
ARRESTED LANDING FATIGUE TEST OF THE MODEL A-6A AIRCRAFT Final Report
Henry D. Lystad 1 Jun. 1972 43 p refs
(AD-745300; NADC-72033-VT) Avail: NTIS CSCL 01/3

A laboratory test was performed on a model A-6A airframe to determine whether the airframe could sustain the arrestment loads associated with 2000 arrestments at an increased gross weight of 36,000 pounds. The Navy Model NEA6-A, BUNO 149935, used as a test specimen, sustained 4000 arrestment test cycles with no major failures satisfying a service life of 2000 arrestments at a gross weight of 36,000 pounds. Author (GRA)

N72-33050# National Transportation Safety Board, Washington, D.C.
EMERGENCY LANDING TECHNIQUES IN SMALL FIXED-WING AIRCRAFT
5 Apr. 1972 16 p refs
(PB-209836; NTSB-AAS-72-3) Avail: NTIS HC $3.00 CSCL 01B

The safety promotion study consolidates known techniques to increase survivability and reduce injuries in forced and precautionary landings in small fixed-wing aircraft. The study stresses the importance of reducing the main injury-producing factor, deceleration forces, and how to use the aircraft and terrain for this purpose. It describes emergency landing techniques for various flight and terrain conditions. Author (GRA)

N72-33051# Northrop Corp., Newbury Park, Calif. Ventura Div.
RINGSAIL PARACHUTE DESIGN
Edgar G. Ewing and Jack R. Vickers Wright-Patterson AFB, Ohio AFFDL Jan. 1972 360 p refs
(Contract F33615-71-C-1815; AF Proj. 412A)
(AD-745335; AFFDL-TR-72-3) Avail: NTIS CSCL 01/3

This document is intended for use as a design handbook for the ringsail parachute. It begins with an historical review of the aerodynamic and structural development of the parachute, including the development of the modified ringsail design used in the Apollo ELS main parachute cluster. Salient characteristics of all ringsail parachutes fabricated and tested over the past 16 years are summarized. An explosion of the present status of ringsail design and operational theory, with special emphasis on a general theory of the inflation characteristics of clustered canopies, is given. Accumulated performance and weight data are presented in tabular and graphical form. A detailed step-by-step procedure for the design of the ringsail parachute is given and illustrated by numerical example. Author (GRA)

N72-33052# National Transportation Safety Board, Washington, D.C.
AIRCRAFT ACCIDENT REPORT: SOUTHERN AIRWAYS, INC. DC-9, N97S TRI-STATE AIRPORT, HUNTINGTON, WEST VIRGINIA, 14 NOVEMBER 1970
14 Apr. 1972 82 p
(PB-209082; NTSB-AAR-72-11) Avail: NTIS HC $3.00 CSCL 01B

Southern Airways, Inc., DC-9, N97S, operating as charter Flight 932, crashed during a landing attempt at the Tri-State Airport, Huntington, West, Virginia, at approximately 1936 e.s.t., on November 14, 1970. All 75 occupants, including 71 passengers and four crewmembers, were fatally injured. The aircraft was destroyed. The crash occurred following impact with trees on a hill approximately 1 mile west of the runway threshold. The National Transportation Safety Board determined that the probable cause of this accident was the descent below minimum descent altitude during a nonprecision approach under adverse operating conditions, without visual contact with the runway environment. Author (GRA)

N72-33968 National Aeronautical Establishment, Ottawa (Ontario). flight Research Lab.
FLYING EXPERIENCE WITH THE SC1 RESEARCH AIRCRAFT AND THE P1127 PROTOTYPE AT THE ROYAL AIRCRAFT ESTABLISHMENT, BEDFORD, ENGLAND
D. M. McGregor *In* NRC of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 43-66 refs (For availability see N72-33964 24-34)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators, and inverters. For related information see also: 09 Electronic Equipment; 22 Nuclear Engineering; and 28 Propulsion Systems.

N72-33053*# TRW Systems Group, Redondo Beach, Calif.
SPACE VEHICLE ELECTRICAL POWER PROCESSING DISTRIBUTION AND CONTROL STUDY. VOLUME 1: SUMMARY Final Report
A. Krausz Jun. 1972 32 p refs
(Contract NAS8-26270)

(NASA-CR-123907) Avail: NTIS HC $3.75 CSCL 10A

A concept for the processing, distribution, and control of electric power for manned space vehicles and future aircraft is presented. Emphasis is placed on the requirements of the space station and space shuttle configurations. The systems involved are referred to as the processing distribution and control system (PDCS), electrical power system (EPS), and electric power generation system (EPGS). Author

N72-33054*# TRW Systems Group, Redondo Beach, Calif.
SPACE VEHICLE ELECTRICAL POWER PROCESSING DISTRIBUTION AND CONTROL STUDY. VOLUME 2: TECHNICAL REPORT Final Report
A. Krausz Jun. 1972 240 p refs
(Contract NAS8-26270)
(NASA-CR-123908) Avail: NTIS HC $14.00 CSCL 10A
For abstract, see N72-33053

N72-33055*# Teledyne Brown Engineering, Huntsville, Ala.
POWER SUPPLY STANDARDIZATION AND OPTIMIZATION STUDY Final Report
C. L. Ware and E. V. Ragusa Jul. 1972 277 p
(Contract NAS8-27798)
(NASA-CR-123906; SE-MSFC-1600) Avail: NTIS HC $16.00 CSCL 10A

A comprehensive design study of a power supply for use in the space shuttle and other space flight applications is presented. The design specifications are established for a power supply capable of supplying over 90 percent of the anticipated voltage requirements for future spacecraft avionics systems. Analyses and tradeoff studies were performed on several alternative design approaches to assure that the selected design would provide near optimum performance of the planned applications. The selected design uses a dc-to-dc converter incorporating regenerative current feedback with a time-ratio controlled duty cycle to achieve high efficiency over a wide variation in input voltage and output loads. The packaging concept uses an expandable mainframe capable of accommodating up to six inverter/regulator modules with one common input filter module. Author

N72-33056*# Gould, Inc., Mendota Heights, Minn.
NON-GASSING NICKEL-CADMIUM BATTERY ELECTRODES AND CELLS Final Report, 15 Jun. 1971 - 15 Jun. 1972
E. Luksha and D. J. Gordy 15 Jul. 1972 126 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953184)
(NASA-CR-128355; Rept-712-122-4) Avail: NTIS HC $8.50 CSCL 10C

The concept of a negative limited nongassing nickel-cadmium battery was demonstrated by constructing and testing practical size experimental cells of approximately 25 Ah capacity. These batteries operated in a gas-free manner and had measured energy densities of 10-11 Wh/lb. Thirty cells were constructed for extensive testing. Some small cells were tested for over 200 cycles at 100% depth. For example, a small cell with an electrodeposited cadmium active mass on a silver screen still had 55% of its theoretical capacity (initial efficiency was 85%). There was no evidence of deterioration of gassing properties with cycling of the nickel electrodes. The charge temperature was observed to be the most critical variable governing nickel electrode gassing. This variable was shown to be age dependent. Four types of cadmium electrodes were tested: an electrodeposited cadmium active mass on a cadmium or silver substrate, a porous sintered silver substrate based electrode, and a Teflon bonded pressed cadmium electrode. The electrodeposited cadmium mass on a silver screen was found to be the best all-around electrode from a performance point of view and from the point of view of manufacturing them in a size required for a 25 Ah size battery. Author

N72-33057*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div. Power Systems.
EVALUATION OF SPACE STATION SOLAR ARRAY TECHNOLOGY First Topical Report Update
Jul. 1972 141 p refs
(Contract NAS9-11039)
(NASA-CR-128533; LMSC-A981486) Avail: NTIS HC $9.25 CSCL 10A

The research concerning lightweight solar array assemblies since 1970 is reported. A bibliography of abstracts of documents used for reference during this period is included along with an evaluation of available solar array technology. A list of recommended technology programs is presented. F.O.S.

N72-33058*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTEGRATED ENGINE GENERATOR FOR AIRCRAFT SECONDARY POWER
Richard R. Secunde 1972 12 p refs Proposed for presentation at the 8th Propulsion Specialists Conf., New Orleans, 29 Nov. - 1 Dec. 1972; sponsored by AIAA
(NASA-TM-X-68139; E-6804) Avail: NTIS HC $3.00 CSCL 10A

An integrated engine-generator for aircraft secondary power generation is described. The concept consists of an electric generator located inside a turbojet or turbofan engine and both concentric with and driven by one of the main engine shafts. The electric power conversion equipment and generator controls are located in the aircraft. When properly rated, the generator serves as an engine starter as well as a source of electric power. This configuration reduces or eliminates the need for an external gear box on the engine and permits reduction in the nacelle diameter. Author

N72-33059*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN POINT CHARACTERISTICS OF A 500 - 2500 WATT ISOTOPE-BRAYTON POWER SYSTEM
G. J. Barna 1972 10 p refs Proposed for Presentation at the 8th Propulsion Specialists Conf., New Orleans, 29 Nov. - 1 Dec. 1972; sponsored by AIAA and Soc. of Automotive Engr.
(NASA-TM-X-68137; E-7138) Avail: NTIS HC $3.00 CSCL 10A

An analytical study was conducted to investigate the potential performance characteristics of an isotope-Brayton space power system at electric power levels from 500 - 2500 watts. Utilization of the Pu(238) heat source, or capsule, was assumed. A single-loop system design concept was selected. The design concept and results of first-order trade-off studies of the effects of major system parameters on system performance are presented. Results of the study indicate the potential for high system efficiency and high specific power over the entire power range. Author

N72-33060*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RECENT TECHNOLOGY ADVANCES IN THE NASA-LEWIS RESEARCH CENTER BRAYTON PROGRAM
Richard Vernon 1972 16 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., San Diego, Calif., 25-29 Sep. 1972
(NASA-TM-X-68140; E-7140) Avail: NTIS HC $3.00 CSCL 10A

A review of the progress and milestones passed in the Brayton program is presented. The 2-to-15 kWe power system was successfully operated in a vacuum with a space-type radiator. Gas loop and electrical subsystem endurance tests have continued to demonstrate long-term operation with one rotating unit surpassing 10,000 hours of failure-free operation. Simplified gas-bearing designs for the rotating unit are being evaluated. Fabrication of an improved design of heat exchanger is nearing completion, and a study of more advanced heat exchanger technology is being conducted. A study was completed to

investigate the applicability of Brayton technology applied to a lower power level (0.5 to 2.5 kWe) and showed potentially very attractive performance, simplicity, and low cost for a system in this power range. Author

N72-33061*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
PHOTOVOLTAIC SOLAR ARRAY TECHNOLOGY REQUIRED FOR THREE WIDE SCALE GENERATING SYSTEMS FOR TERRESTRIAL APPLICATIONS: ROOFTOP, SOLAR FARM, AND SATELLITE
Paul A. Berman 15 Oct. 1972 27 p refs
(Contract NAS7-100)
(NASA-CR-128381; JPL-TR-32-1573) Avail: NTIS HC $3.50 CSCL 10A

Three major options for wide-scale generation of photovoltaic energy for terrestrial use are considered: (1) rooftop array, (2) solar farm, and (3) satellite station. The rooftop array would use solar cell arrays on the roofs of residential or commercial buildings; the solar farm would consist of large ground-based arrays, probably in arid areas with high insolation; and the satellite station would consist of an orbiting solar array, many square kilometers in area. The technology advancement requirements necessary for each option are discussed, including cost reduction of solar cells and arrays, weight reduction, resistance to environmental factors, reliability, and fabrication capability, including the availability of raw materials. The majority of the technology advancement requirements are applicable to all three options, making possible a flexible basic approach regardless of the options that may eventually be chosen. No conclusions are drawn as to which option is most advantageous, since the feasibility of each option depends on the success achieved in the technology advancement requirements specified. Author

N72-33062# Societe Anonyme de Telecommunications, Paris (France).
A STUDY ON THE REDUCTION OF THE ELECTROMAGNETIC INTERFERENCE EMITTED BY A SOLAR CELL ARRAY Final Report [ETUDE DE LA REDUCTION DE L'INTERFERENCE ELECTROMAGNETIQUE EMISE PAR UN RESEAU DE PILES SOLAIRES]
F. Serre ESRO Aug. 1972 59 p In FRENCH; ENGLISH summary
(Contract ESTEC-1213/70)
(ESRO-CR-89) Avail: NTIS HC $5.00

The design and manufacture of a subpanel of solar cells is presented aimed at reducing the effects due to: electric fields generated by photo-emission and plasma interaction; magnetic fields, dc and ac generated by solar array operation in orbit; power losses due to sensors and booms carried by the satellite. The technology developed concerns: the use and interconnection of conductive coating covers; the magnetic compensation of the current loops by special circuits; the use of conventional diode and integral diode solar cells. Author (ESRO)

N72-33063# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INFLUENCE OF BOUNDARY LAYERS ON THE ELECTRICAL CHARACTERISTICS OF MHD GENERATORS
Yu. M. Volkov, D. D. Malyuta, and V. P. Panchenko 10 Mar. 1972 47 p refs Transl. into ENGLISH of the publ. "Vliyanie Pogranichnykh Sloyev na Elektricheskiye Kharakteriskiki MGD Generators" Moscow, Inst. of Atomic Energy, 1970 p 1-28
(AD-745245; FTD-MT-24-1635-71) Avail: NTIS CSCL 10/2

An analysis is made of the boundary layer effect on the electrical characteristics of a Faraday MHD generator. An electrical substitution circuit and a method for calculating its elements are proposed. An analysis is made of the local circuit for the substitution of a channel in a gas-dynamic approximation. It is noted that the questions of the flow of current through a turbulent boundary layer require careful examination. It has been shown that the existing methods for the calculation of real resistance of a boundary layer, which are based on a break in integration on a certain arbitrary boundary from the electrode, give results which are strongly dependent on the selection of this boundary. Author (GRA)

N72-33064# Systems Research Labs., Inc., Dayton, Ohio.
SINGLE CHANNEL INVESTIGATIONS FOR 5 kW CLUSTERED CHANNEL ELECTROFLUID DYNAMIC GENERATOR
K. K. Joshi Wright-Patterson AFB, Ohio ARL Apr. 1972 36 p refs
(Contract F33615-70-C-1515; AF Proj. 7116)
(AD-744832; ARL-72-0059) Avail: NTIS CSCL 10/2

The report presents the results of an investigation that was conducted in support of the design of a 5 kW high charge density clustered channel electrofluid dynamic generator. As thirty Channels will be clustered in parallel for the 5 kW generator, it is desirable to design a channel which is simple, sturdy, and has good operating characteristics. In the charge production section, the geometry provides large spacing (0.100 in.) between corona producing electrodes while keeping flow area small and thereby avoids small dimensions which may be electrically critical. The voltage scheduling electrode, therefore, is used as the attractor electrode for the corona producing electrode. Author (GRA)

N72-33065# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PRESENT AND FUTURE OF FUEL CELLS
V. S. Bagotskii and A. M. Skundin 11 Feb. 1972 17 p Transl. into ENGLISH from Khim. v Shkole (Moscow), v. 25, no. 3, 1970 p 10-16
(AD-743651; FTD-MT-24-1687-71) Avail: NTIS CSCL 10/2

Electric cells, fuel cells and heat engines are compared. The most common fuel cell using H2 and O2 is described in detail. Variations such as plastic-based electrodes, ion-exchange membranes, quasi-solid electrolytes, and high temperature cells are discussed. Author (GRA)

N72-33066# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
DETERMINATION OF SILVER PERCHLORATE DIFFUSION COEFFICIENT BY HOLOGRAPHIC INTERFEROMETRY Final Report
Robert L. Kerr Mar. 1972 53 p refs
(AF Proj. 3145)
(AD-743310; AFAPL-TR-71-27) Avail: NTIS CSCL 07/4

Holographic interferometry was used to find concentration gradients in the electrolyte of a silver-silver perchlorate-silver electrochemical cell. These gradients were then used as the basis for calculation of the diffusion coefficient and the activation energy for silver in silver perchlorate. Based on an Arrhenius plot of these values, the activation energy required for diffusion was found. The object of the work described was to determine the applicability of electrochemical holographic interferometry to battery research. The limitations on the procedure were evaluated and it was concluded that the method could be used to determine diffusion coefficients at electrolyte concentrations of less than 1 molar and with currents of less than 5 ma/sq cm. It was determined that the method can be used as an early screening procedure to evaluate new electrolytes such as those intended for use in lithium batteries where concentrations are characteristically low. Author (GRA)

N72-33067# Radian Corp., Austin, Tex.
STATE-OF-CHARGE INDICATOR FOR ZINC-MERCURIC OXIDE BATTERIES Final Technical Report, Jun. 1971 - Mar. 1972
David C. Jones Wright-Patterson AFB, Ohio AFAPL Mar. 1972 127 p refs
(Contract F33615-71-C-1773)
(AD-743018; RAD-72-400-011-02; AFAPL-TR-72-26) Avail: NTIS CSCL 10/3

The feasibility of using a short duration, high current, constant voltage pulse charging technique to predict the state-of-charge of zinc-mercuric oxide cells and batteries was examined. The approach used in the study was (1) determine the test parameters which provided the greatest variation, (2) construct a standard curve for each battery and temperature, (3) test unknown batteries and match their test response to the standard curve, and (4) discharge the unknown batteries to determine their true state-of-charge at the time of the test. The results were extremely encouraging. Even though only a feasibility study, the technique was able to predict the state-of-charge with a standard deviation of only 6.7%. GRA

N72-33068# Institute of Gas Technology, Chicago, Ill.
LOW-COST ACID FUEL CELL STACKS Final Report
Jun. 1972 108 p refs
(Contract DAAK02-67-C-0063)
(AD-744806) Avail: NTIS CSCL 10/2

The report concerns research to redesign and to improve compact, low-temperature, acid electrolyte fuel cell stacks. These stacks, which use low-platinum loading electrodes, are operated on air and reformed CITE fuel or combat gasoline. Author (GRA)

N72-33069# Air Force Weapons Lab., Kirtland AFB, N.Mex.
THE FAR FIELD PATTERN OF A PARALLEL STAGED MOPA CONFIGURATION Technical Report, Jan. - Mar. 1972
John A. Love, III Jul. 1972 42 p refs
(AD-745391; AFWL-TR-72-117) Avail: NTIS CSCL 20/6

The diffraction of coherent light by two circular apertures arranged in the shape of a Figure 8 is considered. The far-field or focal plane irradiance patterns are calculated and integrated over circular areas. The results are displayed in graphical form using dimensionless coordinates which are functions of the aperture size as well as the amplitude and phase distortions present in the radiation illuminating the aperture. Five cases which represent physically meaningful amplitude and phase profiles in the illuminating light are treated analytically.
Author (GRA)

N72-33070# RAI Research Corp., Hauppauge, N.Y.
MANUFACTURING METHODS FOR HIGH PERFORMANCE GRAFTED-POLYETHYLENE BATTERY SEPARATORS Final Report, 1 Dec. 1970 - 30 Jan. 1972
Vincent D'Agostino and Joseph Lee May 1972 291 p refs
(Contract F33615-70-C-1193; AF Proj. 3960; AF Proj. 3607)
(AD-745571; RAI-429; AFML-TR-72-13) Avail: NTIS CSCL 10/3

The work on the development of new and improved manufacturing methods, controls, equipment and processes was directed toward the generation of methacrylic acid-grafted-polyethylene film for use as a superior alkaline battery separator material. This material is of interest as a means of significantly increasing the life and performance of secondary Ni/Cd and Ag/Zn batteries and thus accomplishing meaningful cost savings. Technology was developed to permit design of equipment for large scale production of the separator material. Pilot equipment for each phase was constructed and operated to establish optimum operating conditions and to determine process controls. Limitations on processing steps such as, film extrusion, crosslinking, grafting, washing, converting, packaging and preliminary and final specifications for raw materials, in-testing processing and the end product were established. A preliminary plant layout for a manufacturing capability of 1,000,000 sq ft/year and product costs are predicted. Author (GRA)

N72-33071# Army Foreign Science and Technology Center, Charlottesville, Va.
CALCULATING THE COEFFICIENT OF COVERAGE OF AREA OF AN UMBRELLA-TYPE CONCENTRATOR
G. Ya. Umarov and A. Sh. Sharafi 13 Jun. 1972 4 p refs Transl. into ENGLISH from Geliotekhnika, Akad. Nauk Uz. SSR (Moscow), no. 5, 1970 p 64-66
(AD-745533; FSTC-HT-23-1007-72) Avail: NTIS CSCL 10/2

The factors which determine the energy characteristics (power, average concentration, distribution of energy on the focal point) of faceted solar energy concentrators are the linear dimensions of the concentrator, the angle of coverage, the shape, dimensions and arrangement of facets on the base of the reflector, the shape of the reflector, the accuracy of fabrication of separate concentrator elements and positioning of its facets, the accuracy of tracking of the sun, and, in addition, the coefficient of coverage of the reflector area by the facets. GRA

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N72-33072* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCESS FOR THE PREPARATION OF BRUSHITE CRYSTALS Patent
Bernard Rubin and James D. Childress, inventors (to NASA) Issued 25 Jul. 1972 2 p Filed 26 Jun. 1970 Supersedes N70-36053 (08 - 19, p 3481)
(NASA-Case-ERC-10338; US-Patent-3,679,360; US-Patent-Appl-SN-50339; US-Patent-Class-23-109) Avail: US Patent Office CSCL 06E

A description is given of the preparation and a process by which a calcium phosphate salt may be deposited on the surface of a tooth. The calcium phosphate is prepared using a gel medium process and deposited through gel diffusion. The use of the salt in repairing and strengthening damaged or weak teeth is discussed. Official Gazette of the U.S. Patent Office

N72-33073*# California Univ., Berkeley. Lawrence Radiation Lab.
STUDY OF THE EFFECTS OF ULTRASONIC WAVES ON THE REPRODUCTIVE INTEGRITY OF MAMMALIAN CELLS CULTURED IN VITRO
Bambino Isidonio Martins Aug. 1971 112 p refs Sponsored in part by NASA
(Contract W-7405-eng-48)
(NASA-CR-128356; LBL-37) Avail: NTIS HC $7.75 CSCL 06P

The effects of monochromatic ultrasonic waves of 0.1, 0.5, 1.0, 2.0 and, 3.3 MHz frequency on the colony-forming ability of mammalian cells (M3-1,V79, Chang's and T-1) cultured in vitro have been studied to determine the nature of the action of ultrasonic energy on biological systems at the cellular level. The combined effect of ultrasound and X-rays has also been studied. It is concluded: (1) Ultrasonic irradiation causes both lethal and sublethal damage. (2) There is a threshold dose rate for lethal effects. (3) The effectiveness of ultrasonic waves in causing cell death probably depends on the frequency and the amplitude of the waves for a given cell line, indicating a possible resonance phenomenon. Author

N72-33074*# National Aeronautics and Space Administration, Washington, D.C.
LYMPHOBLASTIC TRANSFORMATION IN VITRO OF BLOOD LYMPHOCYTES IN CONJUNCTION WITH THE STUDY OF REPEATED SPONTANEOUS ABORTIONS
D. Alcalay, J. Choukroun, and P. Morin Sep. 1972 4 p Transl. into ENGLISH from Gynecol. Obstet. (Paris), v. 70, no. 1, 1971 p 59-62
(NASA-TT-F-14602) Avail: NTIS HC $3.00 CSCL 06E

Nonspecific placental extracts failed to induce hypersensitivity reactions in pregnant and nonpregnant women. The isolation and culturing of the lymphocytes were performed using the technique of Brandt. Author

N72-33075# Civil Aeromedical Inst., Oklahoma City, Okla.
BEHAVIORAL CHANGES FROM CHRONIC EXPOSURE TO PESTICIDES USED IN AERIAL APPLICATION: EFFECTS OF PHOSDRIN ON THE PERFORMANCE OF MONKEYS AND PIGEONS ON VARIABLE INTERVAL REINFORCEMENT SCHEDULES
Mark F. Lewis, Henry W. Mertens, and Jo Ann Steen Aug. 1972 5 p refs
(FAA-AM-72-29) Avail: NTIS HC $3.00

Effects are examined on performance of pigeons and squirrel monkeys of Phosdrin (mevinphos), a cholinesterase-inhibiting pesticide. Variable interval schedules of reinforcement were used with both food and water as rewards. A dose-related decrease in response rate was observed with all animals. Decrements in behavior were observed at doses below which external symptoms of Phosdrin poisoning occurred, indicating the need for further investigation of the behavioral actions of pesticides. Author

N72-33076*# Exotech, Inc., Washington, D.C.
SCIENTIFIC AND TECHNICAL SERVICES FOR DEVELOPMENT OF PLANETARY QUARANTINE MEASURES FOR AUTOMATED SPACECRAFT Quarterly Progress Report, 1 Jul. - 30 Sep. 1972
Edward J. Bacon 15 Oct. 1972 16 p refs
(Contract NASw-2372)
(NASA-CR-128347; QPR-2) Avail: NTIS HC $3.00 CSCL 06M

The progress is reported for all 13 tasks of the program to develop planetary quarantine measures. Results of analyses of the following are included: activities of the SSB, Viking sterilization cycle, Jovian parameters, and review of the Martian data. F.O.S.

N72-33077*# Techtran Corp., Glen Burnie, Md.
TWO PATHWAYS FROM PYRUVATE TO ACETYL-COENZYME A IN YEAST
H. Holzer and H. W. Goedde Washington NASA Oct. 1972 23 p refs Transl. into ENGLISH from Biochem. Z. (West Germany), v. 329, 1957 p 175-191
(Contract NASw-2037)
(NASA-TT-F-13909) Avail: NTIS HC $3.25 CSCL 06M

It is demonstrated that there are two pathways from pyruvate to acetyl coenzyme A in yeast cells. Maceration juice contains the enzymes required for the first pathway: pyruvate decarboxylase, acetaldehyde dehydrogenase and aceto-CoA-kinase, the coenzyme requirements being as follow: DPN or TPN, ATP and coenzyme A. The enzyme (or the enzyme complex) of the second pathway is present in the mitochondria. These particles lack all of the enzymes of the first pathway, while the mitochondrial pyruvate oxidase does not occur in maceration juice. The pyruvate oxidase from mitochondria behaves in the same way as the known animal and bacterial pyruvate oxidases, i.e., the enzyme requires DPN (not TPN), Mg, thiamine pyrophosphate, and coenzyme A (but no ATP) as cofactors. The preparation of soluble pyruvate oxidase from mitochondria is described. Author

N72-33078*# Translation Consultants, Ltd., Arlington, Va.
PHYSIOLOGICAL EFFECTS OF HYPOKINESIA
S. Kozlowski Washington NASA Oct. 1972 24 p refs Transl. into ENGLISH from Postepy Astronautyki (Poland), v. 7, no. 4, 1969 p 25-47
(Contract NASw-2038)
(NASA-TT-F-14563) Avail: NTIS HC $3.25 CSCL 06S

A review of the literature and data concerning the physiological effects of bed rest is presented. Changes in the oxygen transport system and their contribution to diminishing physical working capacity after bed rest is discussed in detail. Possible mechanisms underlying the decrease in aerobic working capacity after bed rest are analyzed. Particular attention is given to changes in body fluid, volume and distribution. The changes in mineral metabolism and endocrine function also are taken into consideration. The importance of the effects of bed rest in space and clinical medicine is reviewed. Author

N72-33079*# Techtran Corp., Glen Burnie, Md.
COMPOSITION OF BONE SUPPORT SUBSTANCE
R. Klement Washington NASA Oct. 1972 12 p refs Transl. into ENGLISH from Z. Physiol. Chem. (West Berlin), v. 184, 1929 p 132-142
(Contract NASw-2037)
(NASA-TT-F-13916) Avail: NTIS HC $3.00 CSCL 06P

Basic and acid equivalent distribution in beef and human bones were determined, with emphasis on the solubility of bone ash and possible composition of basic phosphate under living body conditions. Author

N72-33080*# Becton, Dickinson and Co., Raleigh, N.C. Research Center.
INVESTIGATION OF METHODS FOR STERILIZATION OF POTTING COMPOUNDS AND MATED SURFACES Final Report, 1 Aug. 1969 - 31 Dec. 1971
J. J. Tulius, D. J. Daley, and G. B. Phillips 28 Aug. 1972 140 p refs
(Contract NAS8-24513)
(NASA-CR-128368) Avail: NTIS HC $9.00 CSCL 06M

The feasibility of using formaldehyde-liberating synthetic resins or polymers for the sterilization of potting compounds, mated and occluded areas, and spacecraft surfaces was demonstrated. The detailed study of interrelated parameters of formaldehyde gas sterilization revealed that efficient cycle conditions can be developed for the sterilization of spacecraft components. It was determined that certain parameters were more important than others in the development of cycles for specific applications. The use of formaldehyde gas for the sterilization of spacecraft components provides NASA with a highly efficient method which is inexpensive, reproducible, easily quantitated, materials compatible, operationally simple, generally non-hazardous and not thermally destructive. Author

N72-33081*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
PULMONARY EDEMA AND PLASMA VOLUME CHANGES IN DYSBARISM M.S. Thesis - Texas Univ.
James Allen Joki Jul. 1972 80 p refs
(NASA-TM-X-58095; MSC-07277) Avail: NTIS HC $6.00 CSCL 06S

Two groups of anesthetized, fasted pigs were utilized. One group of 13 animals (8.5 to 16.6 kilograms) was exposed to a high-pressure environment, and the other group of eight animals (6.9 to 20.0 kilograms) constituted the control group. The experimental group was subjected to an atmosphere of 90 percent nitrogen and 10 percent oxygen at a pressure of 50 psig for 30 minutes and then decompressed at a rate 10 psi/min. Plasma volumes, using both iodine-125-tagged-albumin and chromium-51-tagged-cell dilution techniques, were measured before, immediately after, and at 30 and 60 minutes after decompression. Aortic and right-ventricular systolic pressures were also recorded. At 60 minutes after decompression, blood samples were taken, the animals were sacrificed, and the water content of the lungs, kidneys, livers, and spleens was estimated by measuring tissue wet weight and dry weight. Protein extravasation and tissue blood volumes were determined by measuring the iodine-125-tagged-albumin and chromium-51-tagged-cell spaces in homo-genates of the organs under investigation. Author

N72-33082# Brussels Univ. (Belgium).
MEDICAL ATLAS OF RADIONUCLIDES USED IN MEDICINE, BIOLOGY, INDUSTRY, AND AGRICULTURE
S. Simon 1971 374 p refs In FRENCH
(EUR-4606) Avail: AEC Depository Libraries; EUR FB 300

This atlas of radionuclides is intended for small and medium sized users of radioactive substances. For each of the chemical elements, grouped according to the Mendeleev classification, it supplies the documentation necessary for the use of their various radioisotopes currently employed, while guaranteeing adequate protection of workers. For each nuclide and for its various

possible radioisotopes the atlas supplies the radiophysical characteristics, the biological behavior in man in relation to the standard man, with details of the critical organs and modes of elimination, the protection measures, with details of radiotoxicity and the maximum doses prescribed in the Euratom Standards for radiological protection, together with methods of disposal of waste. For industrial doctors responsible for radiation protection the atlas provides documentation dealing with specific decontamination measures, together with methods of detection when these extend beyond the scope of conventional dosimetry.
Author (NSA)

N72-33083# Medizinische Hochschule Hannover (West Germany). Abteilung fuer Biometrie.
STUDY ON DATA PROCESSING APPLIED IN MEDICINE [STUDIE UEBER DIE ANWENDUNG DER DATENVERARBEITUNG IN DER MEDIZIN]
B. Schneider Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. May 1972 116 p In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-DV-72-03) Avail: NTIS; Zentralstelle fuer Atomkernenergie-dokumentation (ZAED), Leopoldshafen, West Ger., 21,90 DM

Proposals concerned with a support of research, technological development, and demonstration projects which will produce an innovation and general application of data processing in the general health service are presented. The development of special periphery units, dedicated data processing systems, and integrated modular constructed information systems are found to be necessary. Author (ESRO)

N72-33084# SysteMed Corp., Dayton, Ohio.
ACUTE TOXICITY IN RATS AND MICE RESULTING FROM EXPOSURE TO HCl GAS AND HCl AEROSOL FOR 5 AND 30 MINUTES Final Report
K. I. Darmer, Jr., E. R. Kinkead, and L. C. DiPasquale Wright-Patterson AFB, Ohio AMRL Apr. 1972 23 p refs
(Contract F33615-70-C-1046; AF Proj. 6302)
(AD-744829; W72001; AMRL-TR-72-21) Avail: NTIS CSCL 06/20

Rats and mice have been subjected to HCl vapor and HCl aerosol for periods of 5 and 30 minutes to determine the acute toxicity of HCl. To simulate as nearly as possible the exposure conditions at rocket engine test firing sites, HCl vapor was mixed with a saturated water droplet mist in a Longley exposure chamber to obtain HCl aerosol atmospheres. The results indicate that HCl vapor and HCl aerosol have comparable toxicity in rats and mice, respectively. The results of the present study were compared to those obtained in another study of HCl vapor toxicity in rabbits and guinea pigs, and it was found that HCl had the same degree of toxicity in mice, rabbits, and guinea pigs, while rats were considerably more tolerant to the effects of HCl. Author (GRA)

N72-33085# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
NOISE AND SPEECH LEVELS ASSOCIATED WITH THE F-111 A PREP AREA Final Report, May - Nov. 1970
Henry C. Sommer and Justus F. Rose, Jr. May 1972 38 p refs
(AD-744828; AMRL-TR-72-2) Avail: NTIS CSCL 20/1

The purpose of the study was to measure the ambient noise environment and speech reception levels associated with the F-111 A flight prep area at McClellan AFB, California; to measure noise attenuation characteristics of several ear protection devices contemplated for use in the ambient noise; and to determine maximum permissible human exposure durations based on these data. The results show that a H-133 (standard AF communication headset, microphone) in combination with a custom molded insert communication earplug would permit personnel to be exposed up to 8 hours continuously at the 70% and 85% engine power settings. These time limits decrease to 36 minutes per 8 hour day during afterburner zone 5. Even in the highest noise levels, communication capability was satisfactory with this earplug/headset combination. Author (GRA)

N72-33086# Naval Underwater Systems Center, Newport, R.I. Space Technology Dept.
A COMPUTER SIMULATED MODEL OF VISUAL PROCESSING
Thomas V. McAndrew 30 May 1972 129 p refs
(NUSC Proj. A-752-04; ZFXX112001)
(AD-744927; NUSC-4323) Avail: NTIS CSCL 06/4

The work performed concerns structural models since it proposes a neutral structure to account for a wide range of behavior and shows that the psychophysical and physiological data are compatible with the proposed structure. The model casts some doubt on the validity of feature extractors which have assumed a high degree of specificity in cortical neurons, based on physiological data alone. In precortical layers the neural network is a logical extension of the Hartline-Ratliff model. A convergent overlapping structure of fiber bundles is proposed in the cortex. A theoretical discussion of the anticipated behavior is presented and two mathematical constraints on the model are discussed. The practical aspects of simulating the model are reviewed and the modeling techniques are described. The model was simulated on a general purpose computer using the FORTRAN V language. The experimental results show that the model exhibits the behavior of brightness compression, contour enhancement, circular receptive fields in precortical layers and straight-edged receptive fields in the cortex. Author (GRA)

N72-33087# Syracuse Univ., N.Y. Lab. of Sensory Communication.
[PHYSIOLOGY OF THE LIMULUS EYE] Semiannual Research Report, 1 Nov. 1971 - 1 May 1972
1 May 1972 36 p refs
(Contract N00014-67-A-0378-0003; Grants NSF GB-8412; NS-03950-10; NS-03950-1050; 0EY00667-01)
(AD-743502; LSC-16) Avail: NTIS CSCL 06/16

Contents: Physiology of the Limulus visual system; Development of an electronic auditory receptor model; Short-term adaptation and incremental response of auditory nerve units; Stapedius responses to pairs of tone bursts; Encoding of light intensity by single receptors in the unexcised Limulus eye; Estimation of the integration time-constant in auditory receptor units; Some effects of short-term adaptation on incremental responses of auditory neurons; On loudness as a function of tone duration. GRA

N72-33088# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
INFRARED RADIOGRAPHY AND RELATED STUDIES: ANNOTATED BIBLIOGRAPHY
James H. Veghte Mar. 1972 72 p
(AD-741950; AMRL-TR-71-127) Avail: NTIS CSCL 06/5

The report contains a highly comprehensive annotated bibliography of infrared radiographic studies conducted up to 1970. With the exception of a limited number of papers listed in the appendix, all papers were personally reviewed by the author. The bibliography was prepared with the hope that it would be of assistance to a wide variety of investigators in the field of infrared radiography. Author (GRA)

N72-33089# Naval Postgraduate School, Monterey, Calif.
PUPIL DIAMETER VARIATION IN A VISUAL INTERPRETATION TASK M.S. Thesis
Thomas Victor Burns Mar. 1972 38 p refs
(AD-743727) Avail: NTIS CSCL 05/10

An indirect measurement of mental effort in interpreting an aircraft instrument was made using changes in pupil diameter and the latency of dilation as measures. Significance was found in latency of dilation across levels of interpretation difficulty, while no significance was found for percent changes in pupil diameter. Results also showed a moving base-line pupil diameter

for all subjects across trials suggesting arousal decrement for the first half of the experiment, with a lesser effect for the latter half of the experiment. Author (GRA)

N72-33090# Rochester Univ., N.Y. Center for Visual Science.
VISUAL SENSITIVITY Technical Report, Jan. 1969 - Dec. 1971
John Lett Brown May 1972 79 p refs
(Contract N00014-67-A-0398-0007)
(AD-744325) Avail: NTIS CSCL 06/16

Sensitivity as the word is used in vision research applies to studies of minimum detectable quantities. The quantities are usually of light required for threshold detection or difference discrimination as influenced by the state of adaptation, the retinal locus, various parameters of the stimulus such as its size, its spatial character and other considerations. The spatial discrimination capability of the eye is perhaps the most important characteristic of the sense of vision. Spatial considerations have been largely with respect to projections within a frontal plane or in the image on the retina. The 1971 review of Spatial Vision has been concerned largely with the discrimination of objects in the visual world as these are distributed in depth. The authors of that review have suggested that relation of the psychophysical data of depth discrimination to the underlying physiological processes is an easier job at the present time than is the case for other aspects of spatial vision. The directness of the relation varies considerably, but many investigators are anxious to relate their findings in psychophysical experiments to the data of electrophysiology or vice versa. GRA

N72-33091# Army Medical Research Lab., Fort Knox, Ky.
COCHLEAR PATHOLOGY IN MONKEYS EXPOSED TO IMPULSE NOISE Progress Report
Valdemar M. Jordan (Case Western Reserve Univ.), Marilyn L. Pinheiro (Case Western Reserve Univ.), Kazuo Chiba (Case Western Reserve Univ.), Armando Jimenez (Case Western Reserve Univ.), and George A. Luz 6 Mar. 1972 31 p refs
(DA Proj. 3A0-61102-B-71-R)
(AD-745105; USAMRL-968) Avail: NTIS CSCL 06/5

The cochleae of ten rhesus macaque monkeys exposed to impulse noise were examined using the surface preparation technique. There was great variability in the severity and extent of damage observed. All inner ears suffered destruction of Corti organ and myelinated nerve fibers along the initial segment of the basilar membrane. Further damage, limited mainly to outer hair cells, peaked at 8 to 10 mm. Generally the third or outermost row of outer hair cells lost the highest percentage of cells. Transitions between normal and damaged areas were abrupt. Hensen's cells were split away from Deiters' cells in the lower basal turn in half the animals. Inner hair cells, myelinated nerve fibers, and reticular lamina were resistant to destruction except in the hook area. Author (GRA)

N72-33092# Naval Personnel and Training Research Lab., San Diego, Calif.
A SELECTIVE REVIEW OF LISTENING RESEARCH
N. H. VanMatre and J. H. Steinemann May 1972 35 p refs
(PF395220020134)
(AD-743946; STB-72-10) Avail: NTIS CSCL 05/10

The literature survey constitutes an initial research effort designed to identify those factors which appear to be critical in auditory comprehension and which may eventually be utilized in programs to enhance the listening abilities of Navy personnel. A review of recent research was needed to assess the new and changing concepts of listening which are now available. A broad survey of listening information sources was conducted, consisting mainly of an overview of the available research literature, correspondence and personal contacts with other research groups, and first-hand evaluation of existing listening programs, equipment, and tests. The findings from the literature were discussed under three topic areas including: Elements of listening, measurement of listening, and relationships of listening ability to other variables. Author (GRA)

N72-33093# Bureau of Radiological Health, Rockville, Md. Div. of Biological Effects.
LOW AND VERY LOW DOSE INFLUENCES OF IONIZING RADIATIONS ON CELLS AND ORGANISMS, INCLUDING MAN: A BIBLIOGRAPHY
Benjamin P. Sonnenblick Feb. 1972 327 p refs
(Contract PH-86-67-133)
(PB-209804; BRH/DBE-72-1; FDA-72-327) Avail: NTIS HC $6.00 CSCL 06R

A bibliography of more than 3400 citations on low and very low level (respectively, below 50 or 10 roentgens, rads, or rems) ionizing radiation effects on biological systems is presented. It is divided in eleven categories, and the citations cover a period from the early 1950's to mid-1969. Author (GRA)

N72-33094# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.
SEQUENTIAL SEARCH OF AN OPTIMAL DOSAGE, 2
Benjamin H. Eichhorn 15 Jul. 1972 18 p refs
(Contract N00014-67-A-0404-0009; NR Proj. 042-276)
(AD-745326; TR-5) Avail: NTIS CSCL 06/5

Sequential search procedures are described for determining an optimal dosage in the following biomedical problem. People are subjected to a certain chemotherapeutic treatment and on the one hand it is desirable to give each individual the maximal possible dosage. On the other hand, high doses create considerable toxicity, and it is undesirable to cross a certain limit of allowable toxicity level. The optimal dosage is defined as the maximal dose for which the proportion of patients in the population whose toxicity level will not cross the allowable limit is gamma. In the present paper the author discusses non-Bayesian sequential search procedures for the optimal dosage, assuming a linear regression between toxicity and dosage, and normal conditional distribution of the toxicity level at each dose. Author (GRA)

N72-33108* National Aeronautics and Space Administration, Washington, D.C.
EXPERIMENTAL RESEARCH ON THE MOVEMENTS IN THE LARGE JOINTS OF ARM
Yu. I. Dolnikov *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 104-115 refs (For availability see N72-33100 24-05)
CSCL 05E

05 BIOTECHNOLOGY

Includes life support systems, human engineering, protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N72-33095 National Lending Library for Science and Technology, Boston Spa (England).
LESIONS OF THE NERVOUS SYSTEM IN DECOMPRESSION SICKNESS
M. P. Elinskii 7 Jun. 1972 12 p refs Transl. into ENGLISH from Russian conf. proc. p 615-622 Presented at 13th Symp. on Psychiat. and Neuropathol., Leningrad, 1968
(NLL-DRIC-Trans-2790-(3623.66); NLL-BR-30161) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The adverse effects of decompression sickness on human and animal (cats and rabbits) nervous systems were studied. Pathological investigations revealed the following: (1) circular cavities in the grey matter of the brain and spinal cord, (2) compressed cerebral matter, (3) traumatic necrosis of brain tissue, (4) wasting arterial and venous vessels, and (5) psychomotor decrement. E.H.W.

N72-33096* Technology, Inc., San Antonio, Tex.
MODIFICATION OF THE PHYSICAL PROPERTIES OF FREEZE-DRIED RICE Patent

Clayton S. Huber, inventor (to NASA) Issued 19 Sep. 1972 2 p Filed 28 Aug. 1970 Supersedes N70-39923 (08 - 22, p 4065) Sponsored by NASA
(NASA-Case-MSC-13540-1; US-Patent-3,692,533; US-Patent-Appl-SN-68023; US-Patent-Class-99-80PS) Avail: US Patent Office CSCL 06H

A process for preparing dehydrated rice during which the rice is cooked in water to a gelatinized state is described. The grain includes about seventy-five percent moisture content. Then the granular rice is subjected to freezing and thawing for two or more cycles. Finally it is frozen and freeze dried to remove moisture. The dehydrated granular rice is quickly rehydrated by placing it in hot water. Official Gazette of the U.S. Patent Office

N72-33097*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
POSTFLIGHT ANALYSIS OF THE APOLLO 14 CRYOGENIC OXYGEN SYSTEM
D. D. Rule Mar. 1972 104 p refs
(Contract NAS9-11576)
(NASA-TM-X-68616; D2-118405-1-Suppl-2; MSC-04112-Suppl-2) Avail: NTIS CSCL 06K

A postflight analysis of the Apollo 14 cryogenic oxygen system is presented. The subjects discussed are: (1) methods of analysis, (2) stratification and heat transfer, (3) flight analysis, (4) postflight analysis, and (5) determination of model parameters. Author

N72-33098*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
EXTRATERRESTRIAL CONSUMABLES PRODUCTION AND UTILIZATION
Alfred P. Sanders May 1972 98 p
(NASA-TM-X-58087; MSC-06816) Avail: NTIS HC $7.00 CSCL 05E

Potential oxygen requirements for lunar-surface, lunar-orbit, and planetary missions are presented with emphasis on: (1) emergency survival of the crew, (2) provision of energy consumables for vehicles, and (3) nondependency on an earth supply of oxygen. Although many extraterrestrial resource processes are analytically feasible, this study has considered hydrogen and fluorine processing concepts to obtain oxygen or water (or both). The results are quite encouraging and are extrapolatable to other processes. Preliminary mission planning and sequencing analysis has enabled the programmatic evaluation of using lunar-derived oxygen relative to transportation cost as a function of vehicle delivery and operational capability. Author

N72-33099# Civil Aeromedical Inst., Oklahoma City, Okla.
THE USE OF SIMPLE INDICATORS FOR DETECTING POTENTIAL CORONARY HEART DISEASE SUSCEPTIBILITY IN THE THIRD CLASS AIRMAN POPULATION
Michael T. Lategola Jul. 1972 10 p refs
(FAA-AM-72-26) Avail: NTIS HC $3.00

Analyses were made of several Framingham heart study indicators of coronary disease in 423,330 male third class airmen. The data were obtained from current aeromedical certification records in January 1971. The distributions of resting blood pressure (BP), resting heart rate (HR) and the 400 pathology code prevalence were compiled in age versus Framingham relative weight index (FRWI) tables. In accordance with the FHS, obesity was defined as a minumum FRWI of 120.0%. Substantiating earlier findings all parameters generally increased with age and obesity. These findings are directly relevant to the mass aeromedical screening, early detection, susceptibility reversal and preventive aspects of CHD. Author

N72-33100*# National Aeronautics and Space Administration, Washington, D.C.
MECHANICS OF MACHINES, NO. 7/8
I. I. Artobolevskiy, ed. Oct. 1972 213 p refs Transl. into ENGLISH of the publ. "Mekhanika Mashin, Vypusk 7-8" Moscow, Nauka Press, 1967 150 p
(NASA-TT-F-14335) Avail: NTIS HC $12.75 CSCL 06B

The principles for designing manipulators are discussed as complex bioengineering systems. The dynamics of reversible follow-up systems as elements of manipulator drives are analyzed along with the influence of discontinuities in the kinematic chain on control systems. Papers on the dynamics of machines are included. For individual titles, see N72-33101 through N72-33114.

N72-33101* National Aeronautics and Space Administration, Washington, D.C.
SOME PROBLEMS OF THE THEORY OF MANIPULATORS
A. Ye. Kobrinsky and Yu. A. Stepanenko *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 1-31 refs (For availability see N72-33100 24-05)
CSCL 06B

Selected problems encountered in the theory of manipulators are reviewed and formulated. Special features of modern type manipulators discussed include: manual manipulators, manipulator maneuverability, dissipative properties of manipulators, bioelectric control systems, and manipulators with automatic controls. F.O.S.

N72-33102* National Aeronautics and Space Administration, Washington, D.C.
INVESTIGATION OF THE DYNAMICS OF A MANIPULATOR'S WORKING ORGAN
V. S. Yastrebov *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 32-43 refs (For availability see N72-33100 24-05)
CSCL 06B

The kinematic chain of a manipulator grasping device with seven degrees of freedom is analyzed. Lagrange equations are used to analyze the inertial loads which are considered to be functions of generalized coordinates. F.O.S.

N72-33103* National Aeronautics and Space Administration, Washington, D.C.
SOME PRINCIPLES OF THE DESIGN OF REMOTELY CONTROLLED MASTER-SLAVE MANIPULATORS
A. Ye. Bor-Ramenskiy, V. S. Kuleshov, N. A. Lakota, and V. I. Lobachev *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 44-58 refs (For availability see N72-33100 24-05)
CSCL 06B

The operating principles of remotely controlled master-slave manipulators are described, and control systems with passive and active force reflections are discussed. Topics discussed include: kinematics and dynamics of the movement of control and manipulation organs, manipulator control systems with slave follow-up systems, and reversible follow-up systems. F.O.S.

N72-33104* National Aeronautics and Space Administration, Washington, D.C.
STRUCTURAL AND ANALYTICAL REPRESENTATION OF REVERSIBLE FOLLOW-UP SYSTEMS
V. S. Kuleshov and N. A. Lakota *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 59-71 (For availability see N72-33100 24-05)
CSCL 06B

Using differential equations written in Laplace transforms, the structural and analytical representation of a remote elastic transmission is derived, and used to construct a reversible follow-up system (RFUS). It is shown that operation of the RFUS requires that the control signal to the slave element on the operator side be equal to the control signal to the slave element on the load side. F.O.S.

N72-33105* National Aeronautics and Space Administration, Washington, D.C.
SOME PECULIARITIES IN THE DESIGN OF REVERSIBLE FOLLOW UP SYSTEMS

B. A. Petrov and A. I. Batyukov *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 72-85 (For availability see N72-33100 24-05)
CSCL 06B

An analogy based on the similarities between mechanical forces (moments) and voltages in electrical circuits is studied in a four-terminal network. Connecting the load to the reversible follow-up system (RFUS) is considered the equivalent of connecting impedance across the output of an electrical circuit. Results of analyzing different RFUS using this method are in agreement with experimental data. F.O.S.

N72-33106* National Aeronautics and Space Administration, Washington, D.C.
MANIPULATORS WITH PERMANENT MAGNETIC CLUTCHES
N. F. Kostin *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 86-93 refs (For availability see N72-33100 24-05)
CSCL 06B

The design of manipulators with permanent magnet clutches that meet safety requirements when handling toxic or dangerous materials is discussed. Two types of magnetic clutches are considered: those with end magnetic clutches, and those with cylindrical magnetic clutches. F.O.S.

N72-33107* National Aeronautics and Space Administration, Washington, D.C.
PRINCIPLES OF THE ARRANGEMENT OF UNIVERSAL MECHANICAL MASTER-SLAVE MANIPULATORS
M. M. Logunov *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 94-103 (For availability see N72-33100 24-05)
CSCL 06B

The principles of the arrangement of manual mechanical master-slave manipulators with flexible couplings are discussed. The main parts of the manipulator are control, slave, horizontal tubes rigidly connecting these parts, and a support. The master-slave movements include: forward and backward, right and left, up and down, rotation relative to the vertical axis of the controlling and slave units, gripping, and rotating the grip. F.O.S.

N72-33108* National Aeronautics and Space Administration, Washington, D.C.
EXPERIMENTAL RESEARCH ON THE MOVEMENTS IN THE LARGE JOINTS OF ARM **c04**
Yu. I. Dolnikov *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 104-115 refs (For availability see N72-33100 24-05)
CSCL 05E

The 1964 work accomplished by the Central Scientific Research Institute of Prosthetics and Orthopedic Appliances in building a device, and developing procedures for recording the functioning of large joints in the human arm as it performs everyday chores is reported. Author

N72-33109* National Aeronautics and Space Administration, Washington, D.C.
EVALUATION BY THE OPERATOR OF THE GRIPPING FORCE WHEN CONTROLLING AN ARTIFICIAL HAND
A. Yu. Shneyder *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 116-134 refs (For availability see N72-33100 24-05)
CSCL 05H

Metering the gripping force exerted by the the tongs of a manipulator, or by the fingers of an artificial hand is reviewed. The devices considered are grouped as devices with feedback metering the gripping force exerted automatically; and devices with feedback such that the operator can take an active part in metering the gripping force. The relative errors in the regulation of gripping force by the fingers of an artificial hand with visual feedback, vibration feedback, and with the fingers of a healthy arm with visual feedback disconnected are summarized. F.O.S.

N72-33110* National Aeronautics and Space Administration, Washington, D.C.
THE ESTIMATION METHOD FOR INVESTIGATING THE MOVEMENT OF A MACHINE UNIT WITH ELASTIC LINKS
V. L. Veyts *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 136-154 refs (For availability see N72-33100 24-05)
CSCL 05H

The problem is reviewed of constructing systems of approximate and refined estimates for solving systems of equations of motion for machine units with electric drives, and elastic links. Methods are developed that provide a practical means for making accurate estimates of the dynamic characteristics of the system. F.O.S.

N72-33111* National Aeronautics and Space Administration, Washington, D.C.
DYNAMICS OF NONLINEAR ELEMENTS WITH BREAKS IN THE KINEMATIC CHAIN **c15**
Yu. A. Stepanenko *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 155-166 refs (For availability see N72-33100 24-05)
CSCL 05H

The influence on a control system of nonlinearities of the type resulting from breaks in a kinematic chain is analyzed. It is shown that when vibration-impact movement regimes are established, the consideration of just the static characteristics of the corresponding nonlinear links fails to show the main behavior patterns of these regimes. Author

N72-33112* National Aeronautics and Space Administration, Washington, D.C.
DYNAMICS OF THE ACCELERATION OF THE DRIVE FOR THE MOCKUP OF A DRILL PRESS TABLE WITH PROGRAMMED CONTROL **c15**
Kh. S. Samidov *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 167-180 refs (For availability see N72-33100 24-05)
CSCL 13I

The optimum operating modes for providing precise interaxial distances required when drilling holes by drill presses with programmed control were studied for high drill press productivity, and for determining the magnitude of the dynamic error. The formulas for use in determining the magnitudes of the mismatch between the movement of the master and slave mechanisms are derived. F.O.S.

N72-33113* National Aeronautics and Space Administration, Washington, D.C.
PRINCIPLES OF THE CONTROL OF MACHINES AND LIVING ORGANISMS BY MEANS OF THE BIOPOTENTIALS OF THE MUSCLES
A. Moretskiy, Yu. Ekel, and K. Fidelyus *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 181-194 refs (For availability see N72-33100 24-05)
CSCL 06B

The principles involved in controlling machines and living organisms by the biopotential of muscles were studied to develop a model for duplicating any program transmitted to it by a living organism over wires or radio. Assuming that command signals can be transmitted for a given muscle by surface electrodes, a model is developed for the upper extremity. It is concluded that the results have practical application in medicine for stimulation of the extremity in cases of neurogenic injuries, in industry as biomechanical stimulators during mass production, and in sports during training to strengthen motor skills. F.O.S.

N72-33114* National Aeronautics and Space Administration, Washington, D.C.
SOME PROBLEMS OF THE DYNAMICS OF MACHINES WITH NONLINEAR CHARACTERISTIC CURVES FOR THE LINKS **c15**
A. N. Golubentsev *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 195-211 refs (For availability see N72-33100 24-05)
CSCL 13I

Possible ways are discussed to solve nonlinear systems of equations by reducing them to Walter integral equations of the second kind, and solving the latter in terms of the resolvent in special functions of a transient process. Author

N72-33115*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Biotechnology Organization.
DESIGN AND DEVELOPMENT OF A PROTOTYPE WET OXIDATION SYSTEM FOR THE RECLAMATION OF WATER AND THE DISPOSITION OF WASTE RESIDUES ONBOARD SPACE VEHICLES
R. B. Jagow 26 May 1972 146 p refs
(Contract NAS1-9183)
(NASA-CR-112151) Avail: NTIS HC $9.50 CSCL 06I

Laboratory investigations to define optimum process conditions for oxidation of fecal/urine slurries were conducted in a one-liter batch reactor. The results of these tests formed the basis for the design, fabrication, and testing of an initial prototype system, including a 100-hour design verification test. Areas of further development were identified during this test. Development of a high pressure slurry pump, materials corrosion studies, oxygen supply trade studies, comparison of salt removal water recovery devices, ammonia removal investigation, development of a solids grinder, reactor design studies and bearing life tests, and development of shutoff valves and a back pressure regulator were undertaken. The development work has progressed to the point where a prototype system suitable for manned chamber testing can be fabricated and tested with a high degree of confidence of success. Author

N72-33116# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
THE BENEFITS OF THE USE OF SHOULDER HARNESS IN GENERAL AVIATION AIRCRAFT
Joseph A. Sirkis Feb. 1972 6 p refs
(FAA-AM-72-3) Avail: NTIS HC $3.00

The installation and use of shoulder harnesses is a practical and relatively inexpensive solution to the problem of maintaining separation between man and machine during an aircraft crash sequence. The addition of shoulder harness to the tie-down chain of the general aviation aircraft occupant will increase the probability of the user surviving a severe crash and minimize injuries resulting from light-to-moderate crashes. It is concluded that if shoulder harnesses were installed in all general aviation aircraft, considerable benefit to the users of these harnesses would accrue. The user-occupant of older general aviation aircraft would realize a level of safety approaching that enjoyed by the user-occupant of normal, utility, or acrobatic category airplanes manufactured under Approved Type Certificates applied for after September 14, 1969. Author

N72-33117# Federal Aviation Administration, Oklahoma City, Okla.
EFFECTIVENESS OF RESTRAINT EQUIPMENT IN ENCLOSED AREAS
D. L. Lowrey Feb. 1972 29 p refs
(FAA Proj. AM-A-71-PRS-37)
(FAA-AM-72-6) Avail: NTIS HC $3.50

A series of 20-g decelerations of a crash sled was conducted to determine the magnitude of head impact decelerations while wearing various types of restraint equipment in small confined areas. Restraint webbing loads and head impact decelerations are presented for three directions of impact (straight forward, and 90 deg to left and right). Restraint wedding undoubtedly reduces head impact velocities, especially in the forward direction. However, the data show that, in most instances, head strikes may be expected even while using upper and lower torso restraint because of the close proximity of surrounding structure in general aviation aircraft. Introduction of upper torso restraint along with lap belts in general aviation aircraft will not relieve the need for delethalizing surrounding structures. Author

N72-33118*# United Aircraft Corp., Windsor Locks, Conn. Hamilton Standard Div.
DESIGN AND FABRICATION OF A FLIGHT CONCEPT PROTOTYPE VAPOR DIFFUSION WATER RECLAMATION SYSTEM
Henry J. Kolnsberg and Donald R. McCann Aug. 1971 142 p refs
(Contract NAS1-8943)
(NASA-CR-111932; SVHSER-5903) Avail: NTIS HC $9.25 CSCL 06I

The design, fabrication and test of an experimental vapor diffusion urine water reclamation system are reported. It utilized a polyvinyl chloride membrane and achieved better than 95 percent recovery efficiency during a 90 day continuous test. The system also incorporated features that exercised microbiological control over the product water. Author

N72-33119# California Univ., Livermore. Lawrence Livermore Lab.
LOW-LEVEL COUNTING WITH SOLID-STATE Ge(Li) DETECTORS
Paul L. Phelps 8 Feb. 1971 52 p refs Presented at the Symp. on the Role of Semiconductor Detectors in the Future of Nucl. Med., Chicago, 12-13 Feb. 1971 Submitted for publication Sponsored by AEC
(UCRL-73023; Conf-710204-5) Avail: NTIS

A review of the operation and characteristics of Ge(Li) gamma spectrometers for low-level counting is given. Resolution and photopeak efficiency, interference from background and Compton radiation, counter shield construction, X-ray fluorescence production, cryostat considerations and signal processing are briefly discussed. Low-level counting results are presented on the analysis of blood serum for Co-57, analysis of rabbit thyroid gland for I-131, analysis of air filter sample for fission product radioisotopes, and analysis of soil for radioisotopes. Also, anticoincidence shielded spectrometers are discussed.
Author (NSA)

N72-33120# Vanderbilt Univ., Nashville, Tenn.
AN EXPERIMENTAL COMPARISON OF SCINTILLATION AND SEMICONDUCTOR DETECTORS FOR ISOTOPE IMAGING AND COUNTING
A. B. Brill, J. A. Patton, and R. J. Baglan [1971] 31 p refs Presented at 13th Scintillation and Semiconductor Counter Symp., Washington, D. C., 1-3 Mar. 1972 Submitted for publication
(Contract AT(40-1)-2401)
(ORO-2401-48; Conf-720306-7) Avail: NTIS

Progress in the development of Si(Li) and Ge(Li) detectors for use in clinical diagnostic studies is outlined. The potential medical applications discussed include activation analysis, radioassay, radioisotope scanning, X-ray fluorescent scanning, X-ray fluorescence analysis, and flow studies. NSA

N72-33121# Naval Air Development Center, Warminster, Pa. Aero-Electronic Technology Dept.
EYE-SAFE OPERATION OF ILLUMINATOR-AIDED IMAGING SYSTEMS
S. B. Campana 19 May 1972 17 p refs
(AD-744656; NADC-72041-AE) Avail: NTIS CSCL 18/6

Eye-safe levels recommended by the three services are given in terms of maximum permissible corneal irradiance. The effect of laser sources with large exit pupils on the eye-safety calculations is discussed. Formulas for determining safe operating conditions are given. Six examples of eye-safety computations are given using the figures provided.
Author (GRA)

N72-33122# Admiral Corp., Chicago, Ill.
MODIFICATIONS TO X-RAY MOTION MONITOR. LOW DOSAGE, WIDE-VARIABLE FIELD TELEVISION RADIOGRAPH FOR BIODYNAMIC ANALYSIS Technical Report,

Jun. 1966 - Sep. 1968
Martin Kozi and Edmund B. Weis, Jr. May 1972 171 p refs
(Contract AF 33(615)-5084; AF Proj. 7231)
(AD-744863; A12301-68-004A; AMRL-TR-72-50) Avail: NTIS CSCL 06/2

The report describes the results of work performed on certain modifications to the Quantitative Motion Monitor System undertaken by Admiral Corporation under a modification addendum to the original contract for the System. These additional efforts resulted in development, design, and delivery to the Air Force of four peripheral subsystems; namely, (1) an X-Ray Detector by means of which the x-radiation during an experiment can be quantized, (2) a System Synchronizer permitting remote operation of other associated equipments (i.e. Motion Picture Camera, Video Tape Recorder, etc.), (3) an Image Enhancer to provide electronic edge enchancing of weak video image signals, and (4) an Automatic Beam Current Control subsystem for electronic control of the Image Orthicon tube; in addition, (5) a study was made of the methods by which the television portion of the system capability could be increased for experimentation by increasing its frequency response (information rate).
Author (GRA)

N72-33123# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES SR-1
1 Sep. 1971 42 p refs
(Contract F33615-70-C-1550; AF Proj. 1710)
(AD-745161) Avail: NTIS CSCL 05/9

The SR-1 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It includes a test of ability to perform five servicing tasks in intermediate inspection and servicing, tasks in helicopter maintenance, an information sheet on experience and training of the technician, a specific inspection test of the oil filters, fuel strainers, and engine chip detector; a performance manual and guide, a performance evaluation sheet, and a test administration evaluation form.
GRA

N72-33124# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES RR-2
1 Sep. 1971 22 p
(Contract F33615-70-C-1550)
(AD-745160) Avail: NTIS CSCL 05/9

The RR-2 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It includes a test of ability to remove and replace the main drive shaft of the helicopter, helicopter maintenance tasks, an information sheet on the technician's experience and training, a performance test of main drive shaft removal and replacement, a performance guide, a performance evaluation sheet, and a form for evaluating test conditions.
GRA

N72-33125# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES RR-1
1 Sep. 1971 22 p
(Contract F33615-70-C-1550; AF Proj. 1710)
(AD-745159) Avail: NTIS CSCL 05/9

The RR-1 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It includes an aptitude test for removing and replacing a helicopter intermediate gearbox, helicopter maintenance tasks, an information sheet on previous experience and training, a performance test on replacing a 42 degree gearbox, a performance guide and replacement instructions, a performance evaluation sheet, and a form for recording test administration conditions.
GRA

N72-33126# State Dept., Washington, D.C.
DOCUMENTS FOR THE UN CONFERENCE ON THE HUMAN ENVIRONMENT, PART 3
Mar. 1972 148 p refs In ENGLISH and FRENCH Conf. held at Stockholm, 5-16 Jun. 1972 Revised
(PB-206618-3-1; A/Conf-48/12) Avail: NTIS HC $3.00 CSCL 13B

The UN system and the human environment; and A/Conf.48/12Bibliography.
GRA

N72-33127# Army Natick Labs., Mass.
A HUMAN FACTORS EVALUATION OF COLD WEATHER FACE MASKS
Carolyn K. Bensel, Richard F. Q. Johnson, and Thomas L. Nichols Apr. 1972 84 p refs
(AD-745087; USA-NLABS-TR-72-73-PR) Avail: NTIS CSCL 05/5

A human factors evaluation of three types of cold weather face mask (the Army Standard and two experimental masks) was made in a series of investigations: A visual field investigation, a psychoacoustic investigation, a personal/equipment compatibility test and an arctic chamber test. Results indicated that (a) all three masks were virtually equivalent with respect to the size of the field of vision and person/equipment compatibility, (b) acceptability of the masks varied from a psychoacoustic point of view as a function of the particular variable being measured, and (c) under simulated arctic conditions, the experimental masks offered far better protection of the wearer's skin than did the standard mask.
Author (GRA)

N72-33128# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES CO-1
1 Sep. 1971 19 p Partly in ENGLISH and partly in VIETNAMESE
(Contract F33615-70-C-1550; AF Proj. 1710)
(AD-745157) Avail: NTIS CSCL 05/9

The CO-1 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It includes an aptitude test to determine a technician's ability to make an operational check of a tail rotor blade, procedures to insert faults to be corrected, helicopter maintenance tasks, an information sheet on experience and training of the technician, a tail rotor blade operational checking test, a performance evaluation sheet, and a sheet to record the conditions of test administration. GRA

N72-33129# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES AD-2
1 Sep. 1971 26 p Partly in ENGLISH and partly in VIETNAMESE
(Contract F33615-70-C-1550; AF Proj. 1710)
(AD-745156) Avail: NTIS CSCL 05/9

The AD-2 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It consists of testing a technician's ability to adjust a misadjusted RPM governor linkage, fault insertion procedures for engine cowlings, helicopter maintenance tasks, an information sheet on experience and training of the technician, RPM governor linkage adjustment tests, test of ability to follow a performance guide, a performance evaluation sheet, and data on test administration conditions.
GRA

N72-33130# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES AD-1
1 Sep. 1971 19 p Partly in ENGLISH and partly in VIETNAMESE
(Contract F33615-70-C-1550; AF Proj. 1710)
(AD-745155) Avail: NTIS CSCL 05/9

A series of 10 advanced type job performance tests was

developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). The 10 tests were used to evaluate the three types of JPA in use by the VNAF, namely job guidance manuals, maintenance dependency type troubleshooting aids, and fully proceduralized troubleshooting aids. Series AD-1 covers power cylinder servo value adjustment tests, helicopter maintenance tests, questionnaire on helicopter maintenance experience and training, flight control adjustment test, evaluation of technician's performance, and details of test conditions. GRA

N72-33131# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES CO-2
1 Sep. 1971 39 p
(Contract F33615-70-C-1550; AF Proj. 1710)
(AD-745158) Avail: NTIS CSCL 05/9

The CO-2 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It includes an aptitude test for checking the operation of an aircraft lighting system, procedures for insertion of faults for correction, helicopter maintenance tasks, an information sheet on maintenance experience and training, operational tests of pitot tube heater, panel lights, and interior and exterior lights, a performance guide and operational checklist, a performance evaluation sheet, and a form for recording test administration conditions. GRA

N72-33132# Matrix Research Co., San Mateo, Calif.
UH-1H JOB PERFORMANCE TESTS (VNAF) SERIES SR-2
1 Sep. 1971 24 p
(Contract F33615-70-C-1550; AF Proj. 1710)
(AD-745162) Avail: NTIS CSCL 05/9

The SR-2 test is one of a series of 10 advanced type job performance tests which were developed for an assessment of the effectiveness of the UH-1H (helicopter) job performance aids (JPA) in use by the Vietnamese Air Force (VNAF). It includes an aptitude test of main drive shaft servicing, helicopter maintenance tasks, an information sheet on experience and training, a 600-hour servicing test of servicing the main drive shaft, a servicing performance guide, a performance evaluation sheet, and a form for recording test conditions. GRA

N72-33133# Batelle Columbus Labs., Ohio.
IMPROVEMENTS TO THE CONTROL BLOCK OF THE MARK 6 MOD 2 SCUBA Task Report, Apr. 1971 - Feb. 1972
Peter S. Riegel and J. S. Glasgow 30 Jun. 1972 22 p refs
(Contract N00014-70-C-0072)
(AD-744235; SUPDIVE-TR-3-72) Avail: NTIS CSCL 06/11

A program was conducted to improve certain deficiencies associated with the control block of the Mark VI Mod 2 SCUBA., a semiclosed-circuit rebreather. The areas to be improved included the bypass valve, the gas metering system, and the differential-pressure gauge. After computation of flows and laboratory testing of components and orifices was performed, a prototype embodying improvement in the problem areas was fabricated and delivered to the Navy. Author (GRA)

06 CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N72-33134*# Tyco Labs., Inc., Waltham, Mass.
THE REDUCTION OF CHLORINE ON CARBON IN AlCl3-KCl-NaCl MELTS
Gerhard L. Holleck [1971] 16 p refs
(Contract NAS12-688)
(NASA-CR-126752) Avail: NTIS HC $3.00 CSCL 07D

Using a rotating vitreous carbon disk electrode, the kinetic parameters for chlorine reduction in an AlCl3-KCl-NaCl (57.5-12.5-30 mol percent) melt were determined. It was found that the reduction of chlorine occurs according to two paths, with the first step probably being rate-determining. Author

N72-33135*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE EFFECT OF AMBIENT PRESSURE ON THE EVAPORATION RATE OF MATERIALS
R. J. Naumann and W. M. Russell 7 Jan. 1972 19 p refs
(NASA-TM-X-64639) Avail: NTIS HC $3.00 CSCL 07D

A simple expression is obtained using a diffusion model for the effect of ambient pressure on the outgassing or evaporation rate of materials. The correctness of the expression is demonstrated by comparing the estimates from this expression with actual weight loss measurements. It is shown that the rate of mass loss is governed by the ratio of mean free path to the characteristic dimension of the surface in question. Author

N72-33136*# Southern Research Inst., Birmingham, Ala.
THE EFFECTS OF THE CONDITIONS OF CHAR FORMATION ON THE PHYSICAL PROPERTIES OF CHARRED PHENOLIC-NYLON
E. D. Smyly and C. D. Pears Jul. 1972 229 p refs
(Contract NAS1-10517)
(NASA-CR-112136) Avail: NTIS HC $13.50 CSCL 07D

A study was made of the effects of the conditions of char formation on the physical properties of charred phenolic nylon of 0.577 gm/cu cm density. It was found that the thermal conductivity and several of the monitors correlate well with degradation conditions. The monitors included electrical resistivity, sonic velocity, porosity, lattice spacing and crystallite size.
Author

N72-33137*# Scientific Translation Service, Santa Barbara, Calif.
THEORY OF STOCHASTIC GRAPHS APPLIED TO THE RANDOM SYNTHESIS AND DEGRADATION OF MULTIFUNTIONAL MACROMOLECULAR COMPOUNDS
G. Champetier Washington Jun. 1972 80 p refs Transl. into ENGLISH from Ann. Chim. (Paris), v. 1, 1966 p 271-302
(Contract NAS7-100)
(NASA-TT-F-14504) Avail: NTIS HC $6.00 CSCL 07D

The behavior of macromolecular multifunctional systems is examined from the structural and stochastic point of view. A theoretical interpretation is proposed based on elementary data from the theory of graphs involving the axiomatic definition of important concepts of intermolecular and intramolecular reactions. Among the various application possibilities and generalizations of the theory are: (1) the inclusion of reticulation and vulcanization in a special case of the gelification phenomenon, and (2) the calculation of various average molecular quantities. The generalization of the theory to systems which comprise monofunctional units is possible due to simple assimilation.
D.L.G.

N72-33138*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATION OF THERMODYNAMICS TO SILICATE CRYSTALLINE SOLUTIONS
Surendra K. Saxena Washington Oct. 1972 49 p refs
(NASA-TN-D-6980; G-1060) Avail: NTIS HC $3.00 CSCL 07B

A review of thermodynamic relations is presented, describing Guggenheim's regular solution models, the simple mixture, the zeroth approximation, and the quasi-chemical model. The possibilities of retrieving useful thermodynamic quantities from phase equilibrium studies are discussed. Such quantities include the activity-composition relations and the free energy of mixing

in crystalline solutions. Theory and results of the study of partitioning of elements in coexisting minerals are briefly reviewed. A thermodynamic study of the intercrystalline and intracrystalline ion exchange relations gives useful information on the thermodynamic behavior of the crystalline solutions involved. Such information is necessary for the solution of most petrogenic problems and for geothermometry. Thermodynamic quantities for tungstates (CaWO4-SrWO4) are calculated. Author

N72-33139# Bendix Corp., Kansas City, Kans.
DEVELOPMENT OF ELASTOMER CUSHIONS, FY71-3 Quarterly Report
G. W. Edman, IV Oct. 1971 19 p Revised
(Contract AT(29-1)-613)
(BDX-613-393-Rev) Avail: NTIS

Five development studies of formulation Y-3332 cellular silicone are discussed. The studies include: (1) the effects of chemical constituents on physical properties, (2) the quantification of frictional shear characteristics, (3) the characterization of surface cell configuration, (4) the effect of time delay at intermediate processing stages, and (5) the determination of rheological properties. Each testing program is described and the resultant work is reported. Author

N72-33140# Bendix Corp., Kansas City, Kans.
MECHANICAL AND PHYSICAL PROPERTIES OF ORGANIC FOAMS Final Report
F. E. Lormis Feb. 1972 60 p refs Revised
(Contract AT(29-1)-613)
(BDX-613-562-Rev; EP46411-00-Rev) Avail: NTIS

Torsional shear, thermal expansion, and thermal conductivity tests were performed on three polyurethane and one polystyrene foam at room temperature, -109 F and -320 F. The shear modulus and ultimate shear strength increased with decreasing temperature and the maximum angle of rotation decreased with temperature as expected. Poisson's ratio was calculated using the tensile and shear moduli but should not be compared to the standard ratio of perpendicular strains. Because the (CF) flexible foam would not support the test fixturing at -109 F and at room temperature, data was not obtained. Author

N72-33141# Miami Univ., Coral Gables, Fla. Dept. of Chemistry.
MECHANISMS OF REACTIONS OF OXIDIZERS Annual Report, 1 Jun. 1971 - 31 May 1972
A. G. Keenan 31 May 1972 6 p
(Contract N00014-67-A-0201-0014)
(AD-744658; AR-11) Avail: NTIS CSCL 07/4

Progress during the year in the investigation of the mechanisms of decomposition of oxidizers such as ammonium nitrate and ammonium perchlorate is briefly summarized.
Author (GRA)

N72-33142# Stevens Inst. of Tech., Hoboken, N.J. Dept. of Chemistry and Chemical Engineering.
EFFECT OF TEMPERATURE VARIATIONS ON MOLECULAR WEIGHT DISTRIBUTIONS BATCH, CHAIN ADDITION POLYMERIZATIONS
Martin E. Sacks, Soo-il Lee, and Joseph A. Biesenberger Jun. 1972 46 p refs
(Contract N00014-68-A-0131)
(AD-744662; TR-35) Avail: NTIS CSCL 07/4

The Maximum Principle was applied to determine the types of temperature variations that minimize and maximize the breadth of the molecular weight distribution (MWD) for chain addition polymerizations in batch reactors. It was found that the variations which minimize the breadth of the MWD keep the instantaneous number average chain length constant. The variations which maximize the breadth of the MWD are step changes in temperature resulting in bimodal distributions. Numerical and experimental examples of such variations are presented. MWDs with minimum and maximum breadths are compared to those that might be formed by temperature variations in real reactors. Under most conditions, temperature variations appear to have a much greater effect on MWD than residence time distributions and micromixing. Author (GRA)

N72-33143# Picatinny Arsenal, Dover, N.J. Explosives Div.
RUBY LASER NANOSECOND FLASH PHOTOLYSIS OF ALPHA-NITRONAPHTHALENE SOLUTIONS
Christos Capellos Jun. 1972 45 p refs
(DA Proj. 1T0-61102-A-32-B)
(AD-744445; PA-TR-4341) Avail: NTIS CSCL 07/5

Nanosecond flash photolysis of alpha-nitronaphthalene (alpha-NO2C10H7) in polar and nonpolar solvents led to the detection of the triplet-triplet absorption spectrum of this nitrocompound. The assignment of the experimentally observed absorption spectrum to the triplet (T(1)) to triplet (T(2)) transition was based on spectroscopic and kinetic studies of phosphorescence and absorption decay of the alpha-NO2C10H7triplet in a PMMA (polymethylmethacrylate) matrix at liquid nitrogen temperature. This assignment was further confirmed by riplet-triplet energy transfer experiments. The change of dipole moment accompany the transition T(1) to T(2) in deaerated ethanol and n-methylformamide was calculated. Rate constants for quenching of the lowest triplet excited state of alpha-NO2C10H7 by molecular oxygen and galvinoxyl stable free radical, as well as by proton and electron transfer reactions, were determined. Author (GRA)

N72-33144# Martin Marietta Corp., Baltimore, Md. Inst. for Advanced Studies.
ON THE SURFACE PHYSICS OF METAL ELECTRODES
R. M. Latanision, N. H. MacMillan, and R. G. Lye Jun. 1972 21 p refs
(Contracts N00014-70-C-0255; F44620-70-C-0097; NR Proj. 036-087)
(AD-745007; RIAS-TR-72-12C; TR-5) Avail: NTIS CSCL 07/4

Some aspects of the thermodynamics of metal surfaces are reviewed and then extended to the particular case of a metal which is functioning as an electrode, with specific reference to electrocapillary phenomena. In contrast to liquid metal electrodes, for which it is known that the surface energy passes through a maximum at the potential of zero charge, this work leads to the conclusion that it is, in fact, the surface stress which is directly affected by variations in the charge density on a solid metal electrode. Author (GRA)

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N72-33145 National Lending Library for Science and Technology, Boston Spa (England).
DIFFRACTION OF RADIO WAVES AROUND THE EARTH'S SURFACE
V. Fock 7 Jun. 1972 31 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), no. 15, 1945 p 479-496
(NLL-DRIC-Trans-2747-(3623.66); NLL-BR-30122) Avail: Natl. Lending Library, Boston Spa, Engl.: 3 NLL photocopy coupons

A statement of the problem of radio wave diffraction is presented, with its solution in series form and summation formulas. The Hertz function was calculated for the illuminated regions and asymptotic expressions are given for the Hankel function. An expression of the Hertz function is given which is applicable to the twilight regions (penumbrae). Author

N72-33146* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
SYSTEM FOR IMPROVING SIGNAL-TO-NOISE RATIO OF A COMMUNICATION SIGNAL Patent
George D. Arndt, inventor (to NASA) Issued 26 Sep. 1972 6 p Filed 7 Aug. 1970 Supersedes N72-20167 (10 - 11, p 1441) Continuation-in-part of US Patent Appl. SN-853763, filed 28 Aug. 1969
(NASA-Case-MSC-12259-2; US-Patent-3,694,753; US-Patent-Appl-SN-61895; US-Patent-Class-325-373; US-Patent-Appl-SN-853763) Avail: US Patent Office CSCL 12B

A superconductive resonant cavity is energized with radio frequency energy. The cavity includes a tuning stub having a piece of semiconductor material mounted on the end. An incoming communication signal modulates a light source optically coupled to the semiconductor by a fiber optic bundle. This varies the dielectric constant of the semiconductor which, in turn, varies the resonant frequency of the cavity. An angle modulation demodulator senses the frequency of the radio frequency oscillations in the cavity and produces a replica of the communication signal with improved signal-to-noise ratio.
Official Gazette of the U.S. Patent Office

N72-33147*# City Coll. of the City of New York. Dept. of Electrical Engineering.
DELTA MODULATION Status Report, 1 Jan. - 1 Jul. 1972
Donald L. Shilling 1 Jul. 1972 22 p
(Grant NGR-33-013-063)
(NASA-CR-128521) Avail: NTIS HC $3.25 CSCL 09D

A paper describing the basic delta modulation systems studied was published. A second paper, describing the systems response to voice and video was presented at the International Communications Conference in June 1972, and a third paper describing several delta modulation systems used for voice and video is scheduled for presentation at the National Telecommunications Conference in December 1972. Author

N72-33148*# Systems Associates, Long Beach, Calif.
ADVANCED COMMUNICATION SYSTEM TIME DOMAIN MODELING TECHNIQUES STUDY (ASYSTD) Final Progress Report, 1 Sep. 1971 - 1 Apr. 1972
M. Fashano, R. M. Gagliardi, and J. A. Sullivan 6 Jun. 1972 42 p refs
(Contract NAS9-11743)
(NASA-CR-128537; R72-004) Avail: NTIS HC $4.25 CSCL 17B

ASYSTD activities are presented dealing with signal to noise ratio and bit error rate measurement, distortion measurement, optimization feasibility, and the definition and systems design implications of mean square error for nonideal, orthogonally encoded channels. Author

N72-33149*# State Univ. of New York, Buffalo. Dept. of Biology.
TRACKING RADAR TECHNIQUES FOR STUDYING MIGRATORY BIRDS
Timothy C. Williams and Janet M. Williams Jul. 1972 11 p
(Grants NGR-33-183-003; NSF GA-259; NSF GB-13246; SUNYRF-508651F)
(NASA-CR-62082) Avail: NTIS HC $3.00 CSCL 17I

The use of NASA tracking radar at Wallops Island and the islands of Bermuda and Antigua to plot the paths of migatory birds in three dimensional space is discussed. Attempts were also made to obtain data on the direction, speed, and density of large numbers of migrating birds. Observational results show that the performance of tracking radars vary considerably with the density of bird migration. At light to moderate levels of migration it is possible to obtain tracks of a variety of types of targets, both large and small. During heavy periods of migration the sky is so filled with targets, that only the largest targets can be tracked for more than a few minutes. E.H.W.

N72-33150*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 136 MHz/400 MHz EARTH STATION ANTENNA-NOISE TEMPERATURE PREDICTION PROGRAM DOCUMENTATION FOR RAE-B
Miranda Chin (Wolf Res. and Develop. Corp., Riverdale, Md.) Sep. 1972 77 p refs Prepared by Wolf Res. and Develop. Corp., Riverdale, Md.
(Contract NAS5-11736)
(NASA-TM-X-66048; X-752-72-327) Avail: NTIS HC $6.00 CSCL 09E

A simulation study to determine the 136 MHz and 400 MHz noise temperature of the ground network antennas which will track the RAE-B satellite during data transmission periods is described. Since the noise temperature of the antenna effectively sets the signal-to-noise ratio (SNR) of the received signal, a knowledge of SNR will be helpful in locating the optimum time windows for data transmission during low-noise periods. Antenna-noise temperatures at 136 MHz and 400 MHz will be predicted for selected earth-based ground stations which will support RAE-B. The antenna-noise temperature predictions will include the effects of galactic-brightness temperature, the sun, and the brightest radio stars. Predictions will cover the ten-month period from March 1, 1973 to December 31, 1973. The RAE-B mission will be expecially susceptible to SNR degradation during the two eclipses of the Sun occurring in this period. Author

N72-33151*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
MAN'S ROLE IN INTEGRATED CONTROL AND INFORMATION MANAGEMENT SYSTEMS
J. L. Nevins and I. S. Johnson Jul. 1972 9 p refs Presented at the 1972 AGARD Tech. Symp. on Automation in Manned Aerospace Systems
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-128541; E-2695) Avail: NTIS HC $3.00 CSCL 05B

Display control considerations associated with avionics techniques are discussed. General purpose displays and a prototype interactive display/command design featuring a pushplate CRT overlay for command input are considered.
Author

N72-33152# System Development Corp., Santa Monica, Calif.
REPORT OF THE CACTOS PROJECT: A PRELIMINARY INVESTIGATION OF COMPUTATION AND COMMUNICATION TRADE-OFFS IN MILITARY COMMAND AND CONTROL SYSTEMS
Norman E. Willmorth 1 Apr. 1972 149 p refs Supersedes SDC-TM-4743/012/00
(Contract DAHC15-67-C-0149; ARPA Order 1327; ARPA Proj. 2D30)
(AD-744670; SDC-TM-4743/012/01; SDC-TM-4743/012/00) Avail: NTIS CSCL 17/2

The progress of the Computation and Communication Trade-Off Study (CACTOS), conducted for the Advanced Research Projects Agency, for the purpose of determining the cost effectivity of new computer hardware, software, and communication channels for future Department of Defense requirements is reported. Efforts to conceptualize DoD information processing needs and to develop analytic models and programs are reported. Technological alternatives are examined. A network analysis model is described. Author (GRA)

N72-33153# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TRANSCRIBED PILOT REPORT (PIREP) BROADCAST SYSTEM, TEST AND EVALUATION Final Report, Jan. 1971 - Jul. 1972
James G. Dong Oct. 1972 27 p
(FAA Proj. 132-221-05X)
(FAA-NA-72-62; FAA-RD-72-97) Avail: NTIS HC $3.50

The results of an automatic transcribed pilot report (PIREP)

system fabricated at the National Aviation Facilities Experimental Center (NAFEC) are presented. The system utilized an off-the-shelf endless loop tape recorder which was integrated in the Flight Service Station/Very High Frequency Omnirange configuration at selected sites. Live operational tests were accomplished to determine equipment deficiencies and operational suitability for consideration of expanding the PIREP concepts to other sites. From the operational tests, the concept was not adopted because of pilot apathy to transmitting PIREPS. Author

N72-33154# Lockheed Missiles and Space Co., Palo Alto, Calif.
AIRCRAFT PANORAMIC RADAR STATIONS, CHAPTER 22
V. V. Grigorin-Riabov 1972 41 p Transl. into ENGLISH from the book "Radiolokatsionnye Ustroistva (Teoriia i Printsipy Postroeniia)" Moscow, Sovetskoe Radio Press, 1970 p 591-653
Avail: NTIS HC $4.25; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Methods for observing a panoramic image of the earth's surface using radars are discussed. Data interpretation is based on the glow brightness of different relief details in relation to a set of electrical properties for the image. Diagrams and mathematical procedures for analyzing data are given. E.H.W.

N72-33155# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany).
LINEARITY MEASUREMENTS OF ACTIVE COMPONENTS FOR 12 GHz TECHNOLOGY TELEVISION TRANSMISSION [LINEARITAETSMESSUNGEN AN AKTIVEN BAUELEMENTEN DER 12-GHz-TECHNIK FUER FERNSEHUEBERTRAGUNG]
K. Luedke Aug. 1971 31 p refs In GERMAN
(FTZ-A-51-TBr-7) Avail: NTIS HC $3.75

Nonlinearity measurements of a step-up frequency converter in a 12 GHz television transmitter are reported. The investigations were carried out to determine the working point of the converter for which the highest possible single sideband power is produced at smallest nonlinear distortion. In addition, converter efficiency, dependence of intermodulation products on the level of pumping and mixing efficiency, and the mixing characteristic were measured. The group delay, and differential phase and amplitude were investigated. Author (ESRO)

N72-33156# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany).
SIMPLIFIED 12 GHz RECEIVING ANTENNA WITH DIRECT FEED [VEREINFACHTE 12-GHz-EMPFANGSANTENNE MIT GERADER EINSPEISUNG]
J. Feldmann and H. A. Koch Mar. 1971 9 p refs In GERMAN
(FTZ-A-417-TBr-11) Avail: NTIS HC $3.00

A microwave antenna is described which is especially suited for television reception in the 12 GHz range. It consists of a parabolic reflector and a straight waveguide as feeder, which is terminated at small distance by a reflecting circular plate near the focus. The plate is attached by means of an insulator. This construction can be realized economically from existing parts. The feed is completely water- and pressureproof. Author (ESRO)

N72-33157# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
PROJECT KARAKA. THE TRANSFORMATION OF POINTS FROM SIDELOOKING RADAR IMAGES INTO THE MAP SYSTEM, PART 1 Final Report
E. R. Bosman, E. Clerici, D. Eckhart, and K. Kubik [1971] 29 p refs
Avail: NTIS HC $3.50

A program system designed to transform side-looking radar (SLAR) images into the map system is described. The program system also includes options for automatically drawing digitized lines of the SLAR images and for performing a statistical analysis of the accuracy of the transformation. Author (ESRO)

N72-33158# General Electric Co., Santa Barbara, Calif.
EVALUATION OF WEDCOM (WEAPON EFFECTS ON D-REGION COMMUNICATIONS) PROPAGATION MODELS
Jun. 1972 66 p refs
(Contract DASA01-69-C-0132)
(AD-744667; Rept-72TMP-12; DNA-2862T) Avail: NTIS CSCL 20/14

The report describes a quantitative evaluation of VLF and LF propagation models used in the WEDCOM (Weapon Effects on D-region Communications) computer code. The evaluation includes magnetic field effects, mode conversion, the effects of low ground conductivity, and the effect of the interface between VLF and LF propagation models. Author (GRA)

N72-33159# Naval Research Lab., Washington, D.C.
APPLICATIONS OF WALSH FUNCTIONS, 1972 PROCEEDINGS OF THE 3D SYMPOSIUM
R. W. Zeek and A. E. Howalter 1972 413 p refs Conf. held at Washington, D. C., 27-29 Mar. 1972 Prepared in cooperation with IEEE, New York
(AD-744650) Avail: NTIS CSCL 09/4

The report contains 64 symposium papers with special interest placed on the application of Walsh and other nonsinusoidal functions. GRA

N72-33160# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SYNCHRONIZATION OF BINARY DATA SYSTEMS
T. A. Schonhoff Jun. 1972 40 p refs
(Contract N00017-72-C-4401)
(AD-744928; APL-TG-1188) Avail: NTIS CSCL 09/4

The report is a tutorial comparison of various methods commonly used to synchronize data of a digital nature. Only synchronizing sequences are considered (i.e., self-synchronizing codes are not considered), and specific examples using pseudo-noise (PN) and Barker codes are presented. A derivation of the number of correctable (or synchronizable) errors as a function of autocorrelation functions is given. Other results include probabilities of correct synchronization and of false synchronization using different methods of data transmission. Noise considerations are included. In keeping with the tutorial nature of the report, a knowledge of basic communication and probability theory is all that should be required for an understanding. Author (GRA)

N72-33161# Ohio State Univ., Columbus. Electroscience Lab.
ADDITIONAL EXPERIMENTAL RESULTS RELEVANT TO TDMA-SYSTEM SYNCHRONIZATION
R. J. Huff, D. C. Upp, T. W. Miller, and J. D. Clover Griffiss AFB, N. Y. RADC Jun. 1972 64 p refs
(Contract F30602-69-C-0112)
(AD-744838; ESL-2738-8; RADC-TR-72-134) Avail: NTIS CSCL 17/2

Experimental results are given which augment the technological basis established previously for designing and instrumenting time division multiple access (TDMA) satellite communications systems, in which two coupled sampled-data delay lock loops are used to perform the timing functions. Emphasis is placed on presenting information needed to design TDMA system synchronizers when only coarse estimates of signal parameters and the instantaneous system geometry are available a priori. Author (GRA)

N72-33162# Innsbruck Univ. (Austria). Electronics Lab.
THEORETICAL EXPERIMENTAL STUDIES OF VLF AND LF WAVES Final Report, 1 Jan. - 31 Dec. 1971
Norbert Nessler 29 Feb. 1972 79 p refs
(Contract F44620-71-C-0071; AF Proj. 4600)
(AD-744868; AFCRL-72-0311) Avail: NTIS CSCL 20/14

A new helical antenna was built with low resonant frequency for use in dissipative media. A theoretical foundation is given for the local periods found by experiment when

measuring an incoming radio signal in a gallery of the mine. The measuring device with automatic range selector which was built for quick and accurate measurements in the mine is described in detail. A new method is discussed for measuring the electric rock parameters in an inhomogeneous and anisotropic medium by means of two frequencies. The distortion of an electromagnetic field at 1000 kHz penetrating a fairly good conductive boundary layer is explained by using the theory of images. Detailed studies were made on receiving elliptically polarized VLF and LF waves. A new method of phase measurement facilitates considerably the measurement of elliptically polarized fields.
Author (GRA)

N72-33163# Naval Ordnance Lab., White Oak, Md.
RAPID DETECTION OF SPECTRAL LINE COMPONENTS IN WIDEBAND NOISE USING A SWEPT SECOND ORDER PHASE LOCKED LOOP PRECEDED BY A DIGITAL TIME COMPRESSOR
John P. Zirbel 7 Feb. 1972 100 p refs
(AD-743904; NOLTR-72-48) Avail: NTIS CSCL 09/4

In some information processing systems, it is desirable to be able to detect the presence of weak spectral line components in wideband noise. In low-power and/or low-cost systems, such spectral line detection is presently most economically accomplished through the use of a swept phase-locked loop. When employed in this manner, the loop can be considered as a kind of variable center frequency bandpass filter that passes signals and rejects noise. When the bandwidth of this filter is narrow relative to the total frequency band to be searched, the time required to sweep through the band may be excessive. This report discusses the manner in which time-compression techniques can be employed to reduce the required detection time. This is done by using a digital time compressor at the input to the phase-locked loop. The resulting system is called a fast phase-locked loop. Author (GRA)

N72-33164# Naval Postgraduate School, Monterey, Calif.
SOME DISTANCE PROPERTIES OF CONVOLUTIONAL CODES M.S. Thesis
Leonard Eric Alfredson Mar. 1972 43 p refs
(AD-743718) Avail: NTIS CSCL 09/4

Various representations of convolutional codes useful in analyzing distance properties are presented. Row distance, column distance, minimum distance, and free distance are defined. Known bounds on these distances are summarized, and where instructive, the methods of proof are indicated. A novel approach to the distance structure of a code is given in the form of a plot of row distance and column distance against depth into the code trellis. Bounds on minimum distance are applied to determine behavior of row and column distance. Finally, the problem of determining the length of sequence necessary to produce the minimum weight codeword is considered. A bound for systematic codes is presented. This bound appears to be the tightest bound on this length presently known. Author (GRA)

N72-33165# Illinois Univ., Urbana. Antenna Lab.
HIGH FREQUENCY BACKSCATTERING FROM AN ELLIPTIC METAL PLATE
S. W. Lee and P. L. E. Uslenghi Jul. 1972 47 p refs
(Contract DAAH01-72-C-0329)
(AD-745114; UIAL-72-6; UILU-ENG-72-2544) Avail: NTIS CSCL 20/14

The high-frequency backscattered field produced by a plane, linearly polarized electromagnetic wave obliquely incident on a perfectly conducting disk of elliptical shape is considered. The leading term of the asymptotic expansion is obtained by means of the geometrical theory of diffraction, and it is matched to the physical optics result for normal incidence via Bessel functions. The formula thus obtained is uniformly valid for all directions of incidence and polarization. It reduces to the known result for a circular disk in the case of zero eccentricity. Numerical results are presented for direct- and cross-polarized monostatic cross sections. The difficulties encountered in obtaining higher-order terms of the asymptotic expansion are discussed in detail.
Author (GRA)

N72-33166# Naval Research Lab., Washington, D.C.
THE UNCERTAINTY OF PULSE POSITION DUE TO NOISE Final Report
Don J. Torrieri 31 May 1972 20 p ref
(NRL Proj. R06-29)
(AD-745294; NRL-7409) Avail: NTIS CSCL 09/4

The time at which a received signal crosses a certain level fluctuates in the presence of noise. A theoretical formula for the standard deviation of this thresholding time is obtained. The formula is applied to the detection of a pulse perturbed by Gaussian noise. Two practical detection schemes, the peak-amplitude estimator and the double differentiator, are theoretically analyzed and compared. Also, a formula is derived which may be used to determine the efficacy of a false-alarm detection system. Author (GRA)

N72-33167# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF DIGITAL SPECTRAL ANALYSIS PROGRAMS AND COMPUTER METHODS UTILIZED AT THE NAVAL POSTGRADUATE SCHOOL IN THE ANALYSIS OF HIGH FREQUENCY RANDOM SIGNALS M.S. Thesis
John DeMille McKendrick Mar. 1972 146 p refs
(AD-745175) Avail: NTIS CSCL 09/4

The digitizing procedure used at the Naval Postgraduate School was investigated for possible sources of noise and other errors. Signals of known form were digitized through the Analog-to-Digital Hybrid computer system (Ci 5000/XDS9300). Similar signals were generated by digital programs on the IBM 360/67. The resultant signals were analyzed by the computer programs UBCFTOR, which computed the Fourier coefficients of each block of data, and by UBCSCOR, which computed the power spectra of the signals. The power-spectral plots of the computer-generated signals were compared with the power-spectral plots of digitized signals. The analog-to-digital process appeared to be relatively noise free. Author (GRA)

N72-33168# Lowell Technological Inst. Research Foundation, Mass.
CORRELATION BETWEEN FMIN (FREQUENCY MINIMUM) AND LOF (LOWEST OBSERVED FREQUENCY)
Klaus Bibl and John R. Herman May 1972 72 p refs
(Contract F19628-69-C-0024; AF Proj. 8666)
(AD-745307; LTIRF-344/IP; AFCRL-71-0619; SR-1) Avail: NTIS CSCL 20/14

Synoptic maps of a normalized function of fmin are used to obtain the integrated absorption along a 10,000 km propagation path for comparison with the lowest observed frequency (LOF) measured by oblique incidence ionosonde over the same path in the month of July 1966. With the integrated absorption represented by a linear summation of normalized fmin at equally spaced points along the path, cross-correlation with LOF for the whole month yields a coefficient of -0.6. Alternative methods of performing the integration of absoption along the path may improve this correlation, so that oblique absorption can be predicted from vertical measurements of fmin. (Author) GRA

N72-33169# Naval Electronics Lab. Center for Command Control and Communications, San Diego, Calif.
MODE CONVERSION PROGRAM FOR AN INHOMOGENEOUS ANISOTROPIC IONOSPHERE Interim Report, Jun. 1971 - Apr. 1972
Richard A. Pappert and Linda R. Shockey 1 May 1972 70 p refs Sponsored by Defense Nucl. Agency
(AD-743948; NELC-IR-722) Avail: NTIS CSCL 20/14

The report presents a program for numerically determining mode conversion coefficients and mode sums for a waveguide which is inhomogeneous along the direction of propagation. The program allows for vertical inhomogeneity of the ionosphere as well as its anisotropy due to the geomagnetic field. The model

assumes the perturbation has no horizontal space dependence perpendicular to the transmitter receiver line. Mode conversion coefficients are obtained by ignoring reflections associated with the inhomogeneity along the direction of propagation. The latter assumption greatly simplifies the calculations and appears to be justified for a broad class of horizontal inhomogeneities. However, its validity under severe artificial ionospheric disturbances requires further study. Author (GRA)

N72-33170# Illinois Univ., Urbana. Coordinated Science Lab.
ON SEQUENTIAL COMMUNICATION SCHEMES WITH INFORMATION FEEDBACK
Abidin Turgay Ural Jun. 1972 131 p refs
(Contract DAAB07-67-C-0199)
(AD-745398; R-571; UILU-ENG-72-2232) Avail: NTIS CSCL 09/4

Two feedback communication schemes with an upper bound on the maximum decision time are analyzed. The first scheme is a sequential system with constant antipodal signaling. In addition to the decision feedback channel, an information feedback channel is used for energy saving. The performance of this scheme is derived for both the noiseless and the noisy feedback channels. Two of the existing systems may be obtained as limiting cases of the combined scheme considered here. An M-ary sequential scheme with intermittent information feedback is also considered. The signals are assumed to be mutually orthogonal over a set of discrete subintervals of the maximum transmission period. It has been shown that both schemes provide a better performance than the corresponding sequential and the nonsequential schemes at the expense of increased signal peak power. Author (GRA)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N72-33171 National Lending Library for Science and Technology, Boston Spa (England).
UNIPEDE DATA PROCESSING SYMPOSIUM: SUMMARY OF REPORTS
7 Jun. 1972 44 p refs Transl. into ENGLISH from "L'Economie Electrique, no. 63" France, Aug. 1971 Mostly in ENGLISH; partly in FRENCH Symp. held in Lisbon, Jun. 1971
(NLL-OA-Trans-696-(6196.3)) Avail: Natl. Lending Library, Boston Spa, Engl.: 4 NLL photocopy coupons

Automatic treatment of billing, consumer management, telemanagement, prospects for data processing in the electricity fields, and applications to accounting, personnel management, and stocks are discussed. On-line computer applications are considered, along with off-line computer applications and information distribution. Programming languages, software, organization problems, and techniques of collection and presentation of information are also included. J.A.M.

N72-33172* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DIGITAL SLOPE THRESHOLD DATA COMPRESSOR Patent
Tage O. Anderson, inventor (to NASA) Issued 26 Sep. 1972 6 p Filed 13 May 1971 Supersedes N71-34188 (09 - 21, p 3399) Sponsored by NASA (NASA-Case-NPO-11630; US-Patent-3,694,581; US-Patent-Appl-SN-143078; US-Patent-Class-179-15.55R) Avail: US Patent Office CSCL 09B

Apparatus is disclosed for data compression by a decreasing slope threshold test using digital techniques in which the data stream through an input register is examined. Only those samples of the raw data are selected for transmission which have a first difference (slope) that exceeds an exponentially decaying threshold function relative to a bias. If a sample is transmitted, it becomes the new bias and a generator of the threshold function is reset. For threshold comparison, the bias is first subtracted from each first difference to produce a second difference for direct comparison of its absolute value with the absolute value of the threshold function, thereby allowing the function generator to run from a constant reference to generate a single-sided exponentially decaying function.
Offical Gazette of the U.S. Patent Office

N72-33173# Arizona Univ., Tucson. Dept. of Electrical Engineering.
PUBLICATIONS OF THE COMPUTER SCIENCE RESEARCH LABORATORY 1970 - 1972
1972 128 p refs
(EES-37; Rept-37-8-72-400) Avail: NTIS HC $8.50

Research and development of various computer simulation techniques and computer equipment are reported. Summaries cover all-digital on-line simulation, DARE 1, 2, and 3 digital simulation systems, and ultrafast hybrid computer optimization techniques. For individual titles, see N72-33174 through N72-33188.

N72-33174 Arizona Univ., Tucson.
CONTINUOUS SYSTEM SIMULATION IN THE 1970'S
Granino A. Korn *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 1-31 refs Presented at 1971 AICA Symp., Tokyo, 3 Sep. 1971 (For availability see N72-33173 24-08)

Recent progress in the development of continuous computer simulation systems is reported. Data cover analog/hybrid hardware for non-simulation purposes, automatic analog-computer patching, and all-digital continuous simulation systems. It was determined that the all-digital system was the only important inovation in the late 1960's and early 1970's E.H.W.

N72-33175 Arizona Univ., Tucson.
THE FUTURE ON LINE CONTINUOUS SYSTEM SIMULATION
Hans M. Aus and Granino A. Korn *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 33-40 refs (For availability see N72-33173 24-08)
(Grants NSF GK-1860; NSF GK-15224)

The feasibility and possible advantages of using all digital on-line simulation based on DARE 1 and 3 (equation orientated) and DARE 2, (block orientated) systems are investigated. The influence of DARE results on future choices of processors, terminals, and program entry methods for simulation are discussed along with future combinations of batch processing with on-line simulation. E.H.W.

N72-33176 Arizona Univ., Tucson.
THE DARE 1 CONTINUOUS SYSTEM SIMULATION SYSTEM
John R. Golz *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 41-45 refs (For availability see N72-33173 24-08)
(Grant NSF GK-1860)

The DARE 1 digital simulation system implements on-line scale-factor-free, all-digital simulation of dynamical systems. System differential equations are typed on the cathode ray tube typewriter of a special simulation console, and solutions appear on a second CRT display. Hard-copy generation and iterative simulation studies are also possible. DARE 1 provides an interactive environment which allows an engineer to solve sophisticated problems directly without first becoming a programmer. Strong emphasis was placed on simplicity of operation and programming, allowing the beginner to learn to use the system quickly. Advanced features are also available which permit the more experienced user to solve complex problems. Author

measuring an incoming radio signal in a gallery of the mine. The measuring device with automatic range selector which was built for quick and accurate measurements in the mine is described in detail. A new method is discussed for measuring the electric rock parameters in an inhomogeneous and anisotropic medium by means of two frequencies. The distortion of an electromagnetic field at 1000 kHz penetrating a fairly good conductive boundary layer is explained by using the theory of images. Detailed studies were made on receiving elliptically polarized VLF and LF waves. A new method of phase measurement facilitates considerably the measurement of elliptically polarized fields.
Author (GRA)

N72-33163# Naval Ordnance Lab., White Oak, Md.
RAPID DETECTION OF SPECTRAL LINE COMPONENTS IN WIDEBAND NOISE USING A SWEPT SECOND ORDER PHASE LOCKED LOOP PRECEDED BY A DIGITAL TIME COMPRESSOR
John P. Zirbel 7 Feb. 1972 100 p refs
(AD-743904; NOLTR-72-48) Avail: NTIS CSCL 09/4

In some information processing systems, it is desirable to be able to detect the presence of weak spectral line components in wideband noise. In low-power and/or low-cost systems, such spectral line detection is presently most economically accomplished through the use of a swept phase-locked loop. When employed in this manner, the loop can be considered as a kind of variable center frequency bandpass filter that passes signals and rejects noise. When the bandwidth of this filter is narrow relative to the total frequency band to be searched, the time required to sweep through the band may be excessive. This report discusses the manner in which time-compression techniques can be employed to reduce the required detection time. This is done by using a digital time compressor at the input to the phase-locked loop. The resulting system is called a fast phase-locked loop. Author (GRA)

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Various representations of convolutional codes useful in analyzing distance properties are presented. Row distance, column distance, minimum distance, and free distance are defined. Known bounds on these distances are summarized, and where instructive, the methods of proof are indicated. A novel approach to the distance structure of a code is given in the form of a plot of row distance and column distance against depth into the code trellis. Bounds on minimum distance are applied to determine behavior of row and column distance. Finally, the problem of determining the length of sequence necessary to produce the minimum weight codeword is considered. A bound for systematic codes is presented. This bound appears to be the tightest bound on this length presently known. Author (GRA)

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(Contract DAAH01-72-C-0329)
(AD-745114; UIAL-72-6; UILU-ENG-72-2544) Avail: NTIS CSCL 20/14

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(AD-745294; NRL-7409) Avail: NTIS CSCL 09/4

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N72-33168# Lowell Technological Inst. Research Foundation, Mass.
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(AD-745307; LTIRF-344/IP; AFCRL-71-0619; SR-1) Avail: NTIS CSCL 20/14

Synoptic maps of a normalized function of fmin are used to obtain the integrated absorption along a 10,000 km propagation path for comparison with the lowest observed frequency (LOF) measured by oblique incidence ionosonde over the same path in the month of July 1966. With the integrated absorption represented by a linear summation of normalized fmin at equally spaced points along the path, cross-correlation with LOF for the whole month yields a coefficient of -0.6. Alternative methods of performing the integration of absoption along the path may improve this correlation, so that oblique absorption can be predicted from vertical measurements of fmin. (Author) GRA

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assumes the perturbation has no horizontal space dependence perpendicular to the transmitter receiver line. Mode conversion coefficients are obtained by ignoring reflections associated with the inhomogeneity along the direction of propagation. The latter assumption greatly simplifies the calculations and appears to be justified for a broad class of horizontal inhomogeneities. However, its validity under severe artificial ionospheric disturbances requires further study. Author (GRA)

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08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N72-33171 National Lending Library for Science and Technology, Boston Spa (England).
UNIPEDE DATA PROCESSING SYMPOSIUM: SUMMARY OF REPORTS
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N72-33172* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DIGITAL SLOPE THRESHOLD DATA COMPRESSOR Patent
Tage O. Anderson, inventor (to NASA) Issued 26 Sep. 1972 6 p Filed 13 May 1971 Supersedes N71-34188 (09 - 21, p 3399) Sponsored by NASA (NASA-Case-NPO-11630; US-Patent-3,694,581; US-Patent-Appl-SN-143078; US-Patent-Class-179-15.55R) Avail: US Patent Office CSCL 09B

Apparatus is disclosed for data compression by a decreasing slope threshold test using digital techniques in which the data stream through an input register is examined. Only those samples of the raw data are selected for transmission which have a first difference (slope) that exceeds an exponentially decaying threshold function relative to a bias. If a sample is transmitted, it becomes the new bias and a generator of the threshold function is reset. For threshold comparison, the bias is first subtracted from each first difference to produce a second difference for direct comparison of its absolute value with the absolute value of the threshold function, thereby allowing the function generator to run from a constant reference to generate a single-sided exponentially decaying function.
Offical Gazette of the U.S. Patent Office

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PUBLICATIONS OF THE COMPUTER SCIENCE RESEARCH LABORATORY 1970 - 1972
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(EES-37; Rept-37-8-72-400) Avail: NTIS HC $8.50

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Hans M. Aus and Granino A. Korn *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 33-40 refs (For availability see N72-33173 24-08)
(Grants NSF GK-1860; NSF GK-15224)

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John R. Golz *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 41-45 refs (For availability see N72-33173 24-08)
(Grant NSF GK-1860)

The DARE 1 digital simulation system implements on-line scale-factor-free, all-digital simulation of dynamical systems. System differential equations are typed on the cathode ray tube typewriter of a special simulation console, and solutions appear on a second CRT display. Hard-copy generation and iterative simulation studies are also possible. DARE 1 provides an interactive environment which allows an engineer to solve sophisticated problems directly without first becoming a programmer. Strong emphasis was placed on simplicity of operation and programming, allowing the beginner to learn to use the system quickly. Advanced features are also available which permit the more experienced user to solve complex problems. Author

N72-33177 Arizona Univ., Tucson.
DARE 2: FAST ON LINE DIGITAL SIMULATION ON A SMALL COMPUTER
Thomas A. Liebert *In its* Publ. of the Computer Sci., Res. Lab., 1970 - 1972 1972 p 46-51 refs Repr. from Ann. de L'Assoc. Intern. pour le Calcul Analogique, no. 4, Oct. 1971 (For availability see N72-33173 24-08)

The DARE 2 is remarkably fast, on-line, all-digital, block-diagram-based simulation system which adds a convenient and inexpensive simulation console to a PDP-9 computer. Block statements, control logic, tabular functions, and data are entered and edited on a CRT keyboard. Solutions appear on a second CRT display and can be plotted or printed out for report preparation. A fully commented program and solution record can be printed out on a teletype and programs may be stored on punched paper tape to be run again at a later date. The DARE 2 system can be easily programmed to make optimal use of the computer, generating a much faster program than a FORTRAN compiler. Author

N72-33178 Arizona Univ., Tucson.
DARE/PHYSBE
Granino A. Korn, John McLeod, and John Wait *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 52-54 refs (For availability see N72-33173 24-08)

The possibility of using DARE 1 to test the PHYSBE experiment is discussed. The PHYSBE experiment is designed to serve as a basis for comparing the relative suitability of various analog, hybrid, and digital systems, and of various digital simulation languages for modeling a particular kind of physiological system. E.H.W.

N72-33179 Arizona Univ., Tucson.
FORRESTER MODELS ON LINE, IN FIVE BRIGHT COLORS
L. E. Kendrick *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 55-56 (For availability see N72-33173 24-08)

The use of DARE 1 to simulate and model social, economic and biological systems is illustrated. E.H.W.

N72-33180 Arizona Univ., Tucson.
DARE 3B: A CSSL TYPE BATCH MODE SIMULATION LANGUAGE FOR CDC 6000-SERIES COMPUTERS
Alexander B. Trevor (Compu-Serv Network, Inc., Columbus, Ohio) and John V. Wait *In its* Publ. of the Computer Sci. Res. Labs., 1970 - 1972 1972 p 57-68 refs (For availability see N72-33173 24-08)

A batch mode FORTRAN based continuous system simulation language for use with the CDC 6000 series computers is described. The DARE 3B language is structured to permit convenient user modification, additions of new integration rules, run-time strategies, or special library subprograms. Major features of the language, basic user information, and examples are included. The spectrum of DARE 3B capabilities are outlined. E.H.W.

N72-33181 Arizona Univ., Tucson.
STATE VARIABLE TECHNIQUES FOR DIGITAL SIMULATION OF BANDPASS SYSTEMS
John V. Wait *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 70-71 refs (For availability see N72-33173 24-08)
(Grant NSF GK-1800)

A technique for representing linear bandpass systems in terms of a state-variable formulation (first-order matrix differential equation) involving complex-valued envelope functions, is discussed. In narrow-band cases this yields a model involving more slowly varying quantities, and thus, less computing time is required for a given simulation task. Author

N72-33182 Arizona Univ., Tucson.
COMPUTER SIMULATION OF COMMUNICATION SYSTEMS WITH STATE VARIABLE REPRESENTATIONS
Michael Andrews *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 72-80 (For availability see N72-33173 24-08)

A new approach to computer-aided design of total communications systems via state-variable models is described. Advantages and extensions to a wide class of stochastic signals are discussed. Author

N72-33183* Arizona Univ., Tucson.
AN OPTIMIZATION STUDY ON A HYBRID COMPUTER
Robert S. Gonzalez *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 82-92 refs Repr. from Ann. de l'Assoc. Intern. pour le Calcul Anologique, no. 3, Jul. 1970 (For availability see N72-33173 24-08)
(Grant NGR-03-002-024)

The maximum principle is applied to minimum-time optimal-control problems, and an optimization algorithm is presented which can be implemented on a hybrid computer. The state and adjoint equations are set up on ASTRAC 2, a high-speed analog computer capable of 1000 differential equation solutions per second. The optimization algorithm is implemented on a PDP-9, an 18-bit, digital computer. The optimization scheme has global and local search phases and uses a vector optimization criterion. Second and third-order bang-bang control systems are studied as examples. Author

N72-33184 Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
A SURVEY OF RANDOM METHODS FOR PARAMETER OPTIMIZATION
R. C. White, Jr. *In* Ariz. Univ. Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 94-101 refs (For availability see N72-33173 24-08)

A class of algorithms known as random search methods was developed for obtaining solutions to parameter optimization problems. The given data provide a guide to the literature in this area, while describing some of the theoretical results obtained as well as the development of practical algorithms. Included are brief descriptions of the problems associated with inequality constraints, noisy measurements, and the location of the global optimum. An attempt is made to indicate types of problems for which random search methods are especially attractive. Author

N72-33185* Arizona Univ., Tucson.
HYBRID COMPUTER OPTIMIZATION OF SYSTEMS WITH RANDOM PARAMETERS
Robert C. White, Jr. *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 102-109 refs (For availability see N72-33173 24-08)
(Grant NGR-03-002-024)

A hybrid computer Monte Carlo technique for the simulation and optimization of systems with random parameters is presented. The method is applied to the simultaneous optimization of the means and variances of two parameters in the radar-homing missile problem treated by McGhee and Levine. Author

N72-33186* Electrotechnical Lab., Tokyo (Japan).
A SOLID STATE CROSSBAR SWITCH FOR AUTOMATIC ANALOG COMPUTER PATCHING
A. Yagi *In* Ariz. Univ. Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 110-112 ref (For availability see N72-33173 24-08)
(Grant NGR-03-002-024)

An all-electronic crossbar switch consisting of FET series-shunt switches inside the feedback loops of operational amplifiers was designed and constructed. Time-shared solution of five different differential equations was obtained by using four integrators on ASTRAC 2, with a new solution being generated 250 times per second. Author

N72-33187 Arizona Univ., Tucson.
A SIMPLE METHOD OF MULTIPROGRAMMING THE PDP-9 COMPUTER
James H. Puls *In its* Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 114-117 ref (For availability see N72-33173 24-08)
(Grant NSF GK-15224)

Simultaneous operation of two or more programs on the PDP-9 computer is discussed. Control is transferred from one program to another when the first program is waiting for I/O. This action is accomplished using the I/O system macro .WAITR, available for all devices operating under the PDP-9 advanced software system and through the use of a simple control program. Consideration is given to the problem of resource allocation, whether system or user programs are to be joined together, and the various control techniques available. Questions of library-program re-entrancy, handler capacity and .DAT slot usage are covered. Author

N72-33188 Compu-Serv Network, Inc., Columbus, Ohio.
AN ALPHA NUMERIC DISPLAY FOR THE PDP-9
John R. Goltz *In* Ariz. Univ. Publ. of the Computer Sci. Res. Lab., 1970 - 1972 1972 p 118-121 (For availability see N72-33173 24-08)

A CC-301 alphanumeric display was interfaced to a PDP-9 computer. The interface hardware and the system software required to implement the display as the system device for the Advanced Software system are discussed. Author

N72-33189*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DDP-116 GENERAL DIGITAL FILTERING
Jack A. Jones and Ronald J. Graham 1 Sep. 1972 39 p refs
(NASA-TM-X-64697) Avail: NTIS HC $4.00 CSCL 09B

The methods are described for calibrating, selecting filter weights, filtering, and computing filter response functions. These methods are computed on a statistical analyzer (STAN) system with a Honeywell DDP-116 central processor. The following filter types are computed: all pass, low pass, high pass, band pass, band rejection, and derivative. Author

N72-33190*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A BRIEF DESCRIPTION AND COMPARISON OF PROGRAMMING LANGUAGES FORTRAN, ALGOL, COBOL, PL/1, AND LISP 1.5 FROM A CRITICAL STANDPOINT
F. P. Mathur 15 Sep. 1972 14 p refs
(Contract NAS7-100)
(NASA-CR-128340; JPL-TM-33-566) Avail: NTIS HC $3.00 CSCL 09B

Several common higher level program languages are described. FORTRAN, ALGOL, COBOL, PL/1, and LISP 1.5 are summarized and compared. FORTRAN is the most widely used scientific programming language. ALGOL is a more powerful language for scientific programming. COBOL is used for most commercial programming applications. LISP 1.5 is primarily a list-processing language. PL/1 attempts to combine the desirable features of FORTRAN, ALGOL, and COBOL into a single language. Author

N72-33191*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Applied Mechanics Div.
VISCEL: A GENERAL-PURPOSE COMPUTER PROGRAM FOR ANALYSIS OF LINEAR VISCOELASTIC STRUCTURES (USER'S MANUAL), VOLUME 1
K. K. Gupta, F. A. Akyuz, and E. Heer 1 Oct. 1972 44 p refs Revised
(Contract NAS7-100)
(NASA-CR-128345; JPL-TM-33-466-Vol-1-Rev-1) Avail: NTIS HC $4.25 CSCL 09E

This program, an extension of the linear equilibrium problem solver ELAS, is an updated and extended version of its earlier form (written in FORTRAN 2 for the IBM 7094 computer). A synchronized material property concept utilizing incremental time steps and the finite element matrix displacement approach has been adopted for the current analysis. A special option enables employment of constant time steps in the logarithmic scale, thereby reducing computational efforts resulting from accumulative material memory effects. A wide variety of structures with elastic or viscoelastic material properties can be analyzed by VISCEL. The program is written in FORTRAN 5 language for the Univac 1108 computer operating under the EXEC 8 system. Dynamic storage allocation is automatically effected by the program, and the user may request up to 195K core memory in a 260K Univac 1108/EXEC 8 machine. The physical program VISCEL, consisting of about 7200 instructions, has four distinct links (segments), and the compiled program occupies a maximum of about 11700 words decimal of core storage. Author

N72-33192*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Astrionics Div.
A COGNITIVE OPERATING SYSTEM (COGNOSYS) FOR JPL'S ROBOT, PHASE 1 REPORT
F. P. Mathur 15 Sep. 1972 35 p
(Contract NAS7-100)
(NASA-CR-128346; JPL-TM-33-568) Avail: NTIS HC $3.75 CSCL 09B

The most important software requirement for any robot development is the COGNitive Operating SYStem (COGNOSYS). This report describes the Stanford University Artificial Intelligence Laboratory's hand eye software system from the point of view of developing a cognitive operating system for JPL's robot. In this, the Phase 1 of the JPL robot COGNOSYS task the installation of a SAIL compiler and a FAIL assembler on Caltech's PDP-10 have been accomplished and guidelines have been prepared for the implementation of a Stanford University type hand eye software system on JPL-Caltech's computing facility. The alternatives offered by using RAND-USC's PDP-10 Tenex operating sytem are also considered. Author

N72-33193*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
USER'S MANUAL FOR MSFC MASK AND DISPLAY PROGRAM
Donald Routh and Dae-Shik Woo (Sperry Rand Corp.) 15 Aug. 1972 39 p
(NASA-TM-X-64696) Avail: NTIS HC $4.00 CSCL 09B

All program options and a detailed definition of the format of each input card (with examples) are given. Output options and their applications are detailed. A listing of the main program is provided and all update points are explained. All information required for a designer/draftsman (for program use) is provided, and it will not be necessary to become intimately familiar with the internal operations to effectively use the extensive capability it has to offer. Author

N72-33194*# Motorola, Inc., Scottsdale, Ariz. Government Electronics Div.
PLATED WIRE MEMORY SUBSYSTEM Final Report, May 1970 - May 1972
LaRon Reynolds and Herschel Tweed May 1972 149 p refs
(Contract NAS5-20155)
(NASA-CR-130093) Avail: NTIS HC $9.50 CSCL 09B

The work performed entailed the design, development, construction and testing of a 4000 word by 18 bit random access, NDRO plated wire memory for use in conjunction with a spacecraft imput/output unit and central processing unit. The primary design parameters, in order of importance, were high reliability, low power, volume and weight. A single memory unit, referred to as a qualification model, was delivered. Author

N72-33195*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A WORKLOAD MODEL AND MEASURES FOR COMPUTER

PERFORMANCE EVALUATION
H. Kerner and K. Kuemmerle Washington Oct. 1972 31 p refs
(NASA-TN-D-6873) Avail: NTIS HC $3.00 CSCL 09B

A generalized workload definition is presented which constructs measurable workloads of unit size from workload elements, called elementary processes. An elementary process makes almost exclusive use of one of the processors, CPU, I/O processor, etc., and is measured by the cost of its execution. Various kinds of user programs can be simulated by quantitative composition of elementary processes into a type. The character of the type is defined by the weights of its elementary processes and its structure by the amount and sequence of transitions between its elementary processes. A set of types is batched to a mix. Mixes of identical cost are considered as equivalent amounts of workload. These formalized descriptions of workloads allow investigators to compare the results of different studies quantitatively. Since workloads of different composition are assigned a unit of cost, these descriptions enable determination of cost effectiveness of different workloads on a machine. Subsequently performance parameters such as throughput rate, gain factor, internal and external delay factors are defined and used to demonstrate the effects of various workload attributes on the performance of a selected large scale computer system.
Author

N72-33196# Compagnie des Ferrites Electroniques, Montrreuil (France).
WAFERED FERRITE STORAGE DEVICES. STUDY OF MANUFACTURING LINE ELEMENTS Final Report, 1 Jan. - 31 Jul. 1970 [MEMOIRE A GAUFRE. ETUDE D'ELEMENTS DE CHAINE PILOTE]
P. Meunier Sep. 1970 47 p In FRENCH
(Contract DegInf-68.02.043.00.212.75.01)
Avail: NTIS HC $4.50

A pilot production line for wafered ferrite computer storage devices was designed. The manufacturing process, including the pilot line for electrolytic deposition of copper and Permalloy, and stacking of elementary boards, is described. Two prototypes of storage devices with a capacity of 512 16-bit words, an access time of 70 nanoseconds, and a cycle duration of 100 nanoseconds were manufactured. The production line will have a capacity of 10 megabits per year. Production costs are discussed.
Author (ESRO)

N72-33197# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
AUTOMATIC CONTOUR MAP PLOTTING Ph.D. Thesis - Tech. Hochschule Darmstadt, West Ger. [AUTOMATISCHE ZEICHNUNG VON HOEHENLINIENPLAENEN]
Gerhard Brunken 1972 102 p refs In GERMAN
(Ser-C/Diss-173) Avail: NTIS HC $7.25

Existing automatic contour line plotting systems are discussed. A program is presented which takes into account the specific needs for cartography. It permits an entirely automatic drawing of contour lines from input data provided by a field team. Processing of data requires only a medium size computer. For special cases a subroutine is provided for manual corrections.
Author (ESRO)

N72-33198# Selenia S.p.A., Rome (Italy). Space Activities Div.
STUDY AND SIMULATION OF AN ON-BOARD COMPUTER FOR A SATELLITE. VOLUME 2: TASK DEFINITION AND COMPUTER ARCHITECTURE
S. Boesso, S. Bottalico, M Canevari, P. Fanchiotti, G. Cicerchia, B. DiMarco, R. Gamberale, F. Marcoz, R. Somma, and A. Bellini Paris ESRO Mar. 1972 298 p refs
(Contract ESTEC-1115/70)
(ESRO-CR-70) Avail: NTIS HC $17.00

A general purpose computer for use on board a satellite was studied and a program for simulation is given. The proposed machine has to satisfy the following requirements: power consumption around 10 watts, weight around 5 kg, volume around 0.005 cu m, probability of success 90% in 12 to 18 months in orbit. The computer architecture is tailored to the results of the analysis of some typical satellite missions, considered to be representative of a wide range of spacecraft applications. The proposed computer is reprogrammable in flight via a TT and C system. It is microprogrammed and can easily be expanded in a multiprocessing configuration. The latter characteristics make the computer attractive for a wide range of applications. Simulator and assembler programs, to be run on an IBM 360 computer, are supplied, in order to write and debug operational programs on the ground before or during the flight.
Author (ESRO)

N72-33199# Bonn Univ. (West Germany). Inst. fuer Gesellschafts- und Wirtschafts-Wissenschaften.
STATISTICAL DATA COLLECTION CONCERNING A RESEARCH PROJECT ON THE BENEFITS OF PROMOTING DATA PROCESSING [STATISTISCHER SAMMELBAND ERSTELLT IM RAHMEN DES FORSCHUNGSAUFTRAGS STUDIE UEBER DEN NUTZEN DER FOERDERUNG DER DATENVERARBEITUNG]
U. Jacob, comp. and H. Jungemann, comp. Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Aug. 1972 203 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-DV-72-04) Avail: NTIS; Zentralstelle fuer atomkernenergie-dokumentation (ZAED), Leopoldshafen, West Ger., 41,80 DM

Statistics are presented on the development of the number and value of computer installations in several countries. The development of computer installations in Germany and other countries is described. Government expenditures are shown with regard to the EDP sector. Certain efficiency data are listed for computers in Germany and France. A comparison of growth rate in a number of computers is given for several countries. The increases in computer investments relative to the GNP and NNP are shown.
Author (ESRO)

N72-33200# Illinois Univ., Urbana. Coordinated Science Lab.
AN EXPERIMENTAL, HIGH DENSITY OPTICAL MEMORY. PART 2: ELECTRON SPIN DEPENDENT TRAPPING AND TUNNELING PROCESSES IN KCl AND KCl:NaCl
James Vinton Burt May 1972 140 p refs Sponsored in part by ARPA
(Contract DAAB07-67-C-0199; N00014-67-A-0305-0015)
(AD-744626; R-557; UILU-ENG-72-2218-Pt-2) Avail: NTIS CSCL 09/2

An experimental, high density optical memory using the M(A) center in KCl:NaCl has been built to study the application of color centers as read, write, and erase computer bulk memories. The M(A) center is employed as a binary indicator by making use of its ability to reorientate in the KCl:NaCl lattice when excited with either vertically or horizontally polarized 531 nm light. Information is read out with circularly polarized 531 nm light. Studies on the initial system indicate that both writing times of less than 4 microsecond duration and packing densities exceeding 10 to the 6th power bits/sq cm will be possible in a fully developed system. Studies have also been made on the M+(A) center, an ionized M(A) center involved in the reorientation process of the M(A) center.
Author (GRA)

N72-33201# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A CIRCUIT FOR CONTROLLING A HIGH SPEED DIGITAL RECORDER
V. A. Ezhkov and A. G. Ryzhevskiy 2 Mar. 1972 11 p Transl. into ENGLISH from Mekhaniz. i Avtomatiz. Upr. (Kiev), no. 5, 1968 p 28-30
(AD-743676; FTD-HT-23-1100-71) Avail: NTIS CSCL 09/2

The Penza Polytechnical Institute has developed and tested a circuit for controlling the high-speed BPM-20 printing mechanism. The circuit is made up of semiconductor devices, which permits using the printing mechanism in a complex with a

number of digital measuring devices. The operation of the functional circuit is based on the bit-by-bit comparison of the numbers obtained at the outputs of the digital measuring device with the state of the output register of the high-speed printing mechanism. From the synchronizing drum of the printing mechanism there is issued in sequence a number of pulses which alternately resets given flip-flops of the output register to states corresponding to the numbers from 0 to 9. Author (GRA)

N72-33202# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RESEARCH IN THIN FILM MEMORIES
Janos Katona 29 Jul. 1971 16 p refs Transl. into ENGLISH from Hiradastechnika (Hungary), v. 21, no. 11, 1970 p 339-342
(AD-744703; FTD-HC-23-392-71) Avail: NTIS CSCL 09/2

The Research Institute for the Communication-Technological Industry investigated the technology and structure of thin magnetic-layer memories for the past five years. Data on the vapor-deposited plane memories and wire memories were presented. Electron micrographs were presented of a 80/20 Ni/Fe layer (15,000 X magnification), a 60/40 Ni/Fe layer (15,000), and a pure Fe layer (15,000). The instrument devised for establishing the hysteresis characteristics and some hysteresis diagrams for a 81/19 Ni/Fe layer were shown. The wire memories were found to have a number of advantages over the plane memories, but they are more heat-sensitive. Author (GRA)

N72-33203# New York Univ., N.Y. Dept. of Electrical Engineering and Computer Science.
DIGITAL COMPUTER TRANSFORMATIONS FOR IRREGULAR LINE DRAWINGS
Giovanni B. Reggiori Apr. 1972 181 p refs
(Contract N00014-67-A-0467-0010)
(AD-745015; TR-403-22) Avail: NTIS CSCL 09/2

The report describes a parametric quantization scheme for irregular line drawings. With this scheme, different quantized versions of the same drawing can be obtained by changing the values of the parameters. Three figures of noise are proposed for evaluating the quality of quantized drawings and design formulae are developed for the parameters of the quantization scheme as functions of bounds on the figures of noise. The degradation of the quality of a quantized drawing resulting from a coordinate transformation and requantization is studied in terms of transformed figures of noise. Also, it is shown theoretically and by means of a number of examples how to choose the parameters of the quantization scheme in order to meet the requirements on the transformed figures of noise. This enables one to quantize a preprocessed satellite picture so that after computation of a Mercator projection, the resulting geographic map will have the required quality. The theory presented in this report is applicable to any irregular line drawing and to any transformation defined by a pair of functions that are continuous together with their partial derivatives. Author (GRA)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N72-33204* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CONTINUOUSLY VARIABLE VOLTAGE CONTROLLED PHASE SHIFTER Patent
Carl E. Johns, inventor (to NASA) Issued 16 Nov. 1971 5 p Filed 9 Dec. 1969 Supersedes N70-35396 (08 - 19, p 3514) Sponsored by NASA
(NASA-Case-NPO-11129; US-Patent-3,621,406; US-Patent-Appl-SN-883523; US-Patent-Class-328-155; US-Patent-Class-307-262; US-Patent-Class-307-295; US-Patent-Class-328-24) Avail: US Patent Office CSCL 09E

A continuously variable phase shifter includes a phase splitter which provides four quadrature signals of an input signal, a summing resistor, and a phase control diode matrix between the phase splitter and the summing resistor. The matrix includes a separate diode in the path of each of the four signals. The four diodes are connected to two terminals at which dc control voltages are applied to control the states of conduction of the four diodes. The diodes are controlled so that only one diode is fully forward biased when 0, 90, 180, or 270 deg phase shift is desired, while two of the four diodes are partially forward biased when a phase shift between any two of the above four values is desired. Official Gazette of the U.S. Patent Office

N72-33205* Texas Instruments, Inc., Dallas.
INTEGRATED CIRCUIT INCLUDING FIELD EFFECT TRANSISTOR AND CERMET RESISTOR Patent
George A. Brown and Victor Harrap, inventors (to NASA) Issued 26 Sep. 1972 5 p Filed 19 Feb. 1971 Supersedes N72-11231 (10 - 02, p 0179) Sponsored by NASA
(NASA-Case-GSC-10835-1; US-Patent-3,694,700; US-Patent-Appl-SN-116778; US-Patent-Class-317-101A; US-Patent-Class-317-235A; US-Patent-Class-317-235AJ; US-Patent-Class-317-235) Avail: US Patent Office CSCL 09A

A single integrated circuit chip is described, which includes a field effect transistor having an insulating layer of silicon nitride covering an interface between a silicon substrate and a silicon oxide layer. A thin film cermet resistor on the nitride layer is connected to an ohmic contract of a field effect transistor electrode. Official Gazette of the U.S. Patent Office

N72-33206*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MANUFACTURE AND QUALITY CONTROL OF INTERCONNECTING WIRE HARDNESSES, VOLUME 1
1 Sep. 1972 210 p refs 4 Vol.
(NASA-TM-X-64685-Vol-1) Avail: NTIS HC $12.50 CSCL 09E

A standard is presented for manufacture, installation, and quality control of eight types of interconnecting wire harnesses. The processes, process controls, and inspection and test requirements reflected are based on acknowledgment of harness design requirements, acknowledgment of harness installation requirements, identification of the various parts, materials, etc., utilized in harness manufacture, and formulation of a typical manufacturing flow diagram for identification of each manufacturing and quality control process, operation, inspection, and test. The document covers interconnecting wire harnesses defined in the design standard, including type 1, enclosed in fluorocarbon elastomer convolute, tubing; type 2, enclosed in TFE convolute tubing lines with fiberglass braid; type 3, enclosed in TFE convolute tubing; and type 5, combination of types 3 and 4. Knowledge gained through experience on the Saturn 5 program coupled with recent advances in techniques, materials, and processes was incorporated. Author

N72-33207*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MANUFACTURING AND QUALITY CONTROL OF INTERCONNECTING WIRE HARNESSES, VOLUME 2
1 Sep. 1972 170 p refs 4 Vol.
(NASA-TM-X-64685-Vol-2) Avail: NTIS HC $10.50 CSCL 09E

Interconnecting wire harnesses defined in the design standard are considered, including type 4, open bundle (not enclosed). Knowledge gained through experience on the Saturn 5 program coupled with recent advances in techniques, materials, and processes was incorporated into the document. Author

N72-33208*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MANUFACTURE AND QUALITY CONTROL OF INTERCONNECTING WIRE HARNESSES, VOLUME 3

1 Sep. 1972 185 p refs 4 Vol.
(NASA-TM-X-64685-Vol-3) Avail: NTIS HC $11.25 CSCL 09E

The document covers interconnecting wire harnesses defined in the design standard, including type 6, enclosed in TFE heat shrink tubing; and type 7, flexible armored. Knowledge gained through experience on the Saturn 5 program coupled with recent advances in techniques, materials, and processes was incorporated into this document. Author

N72-33209*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MANUFACTURING AND QUALITY CONTROL OF INTERCONNECTING WIRE HARNESSES, VOLUME 4
1 Sep. 1972 99 p refs 4 Vol.
(NASA-TM-X-64685-Vol-4) Avail: NTIS HC $7.00 CSCL 09E

The document covers interconnecting wire harnesses defined in the design standard, including type 8, flat conductor cable. Volume breadth covers installations of groups of harnesses in a major assembly and the associated post installation inspections and electrical tests. Knowledge gained through experience on the Saturn 5 program coupled with recent advances in techniques, materials, and processes was incorporated into this document. Author

N72-33210*# Westinghouse Electric Corp., Youngwood, Pa. Semiconductor Div.
DEVELOPMENT OF HIGH SPEED POWER THYRISTOR: THE GATE ASSISTED TURN-OFF THYRISTOR Final Report
D. R. Hamilton, J. Brewster, D. Frobenius, and T. Desmond 31 Jul. 1972 85 p refs
(Contract NAS12-2198)
(NASA-CR-120832) Avail: NTIS HC $6.25 CSCL 09A

A high speed power switch with unique turn-off capability was developed. This gate-assisted turn-off thyristor was rated at 609 V and 50 A with turn-off times of 2 microsec. Twenty-two units were delivered for evaluation in a series inverter circuit. In addition, test circuits designed to relate to the series inverter application were built and demonstrated. Author

N72-33211# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Material und Festkoerperforschung.
NEWSLETTER IN STEREOLOGY: QUANTITATIVE IMAGE ANALYSIS WITH ELECTRONIC IMAGE ANALYZERS
Gerhard Ondracek Dec. 1971 114 p refs In GERMAN; ENGLISH summary
(NP-19324) Avail: AEC Depository Libraries

Ten articles on quantitative image analysis are presented. Information is included on new measuring methods; sources of errors in image analysis measurements; an explanation of the different tube types such as Orticon, Vidicon, and Plumbicon and their advantages and limitations; the contribution of the optical equipment to the accuracy of measurement; and possible microscopic errors. Examples of future applications in materials science as well as in nuclear physics, biology, and medicine are discussed. Author (NSA)

N72-33212# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
STUDY ON OMNIDIRECTIONAL SATELLITE ANTENNAS FOR TELEMETERING AND TRACKING IN THE UHF BAND Final Report
K. A. Koob and G. P. Zerwes Paris ESRO May 1972 112 p refs
(Contract ESTEC-816/69)
(ESRO-CR-52) Avail: NTIS HC $7.75

An extensive literature survey is summarized containing a description of theoretical and practical antenna models and a detailed list of papers. A short explanation of the theoretical aspects of isotropic and quasi-isotropic antennas is given. Six possible types are analyzed and described. Antenna systems using circumferential arrays fed in phase or with 2 pi phase variation and systems using only few radiators with orthogonal polarization were found to be the adequate solutions for large D/lambda structures. The antenna system with few radiators which is based on the principle of the orthogonal polarization has been investigated experimentally. The measurements were performed with two different scaled-down satellite models. It could be shown clearly that the theoretically predicted quasi-isotropic radiation characteristic can be realized. Author (ESRO)

N72-33213# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany).
SINGLE ELEMENT MICROWAVE SEMICONDUCTOR OSCILLATORS AND THEIR STABILITY [EINELEMENT-MIKROWELLEN-HALBLEITEROSCILLATOREN UND IHRE STABILITAET]
E. Seebald Feb. 1971 51 p refs In GERMAN
(FTZ-A-463-TBr-3) Avail: NTIS HC $4.75

The electrical properties, and noise performance of microwave oscillators are discussed based on the representation of mechanisms in electron transfer and avalanche transit time semiconductor elements. The performance of semiconductor microwave oscillators can be compared to that of single chamber klystrons. In addition, a simple passive stabilization allows improvement of FM noise. As is shown theoretically, the stabilization is better with a transit resonator than with a single gate resonator, when power loss is higher than 1 dB. Measurements show improvement in FM noise when single gate stabilization is used. The stabilization circuits used for microwave tubes can also be used for long term stabilization. Author (ESRO)

N72-33214# Army Electronics Command, Fort Monmouth, N.J.
COMPUTER AIDED DESIGN OF BRAID PARAMETERS FOR COAXIAL CABLE
Jack Spergel Nov. 1971 40 p
(DA Proj. 1H6-62705-A-057)
(AD-744797; ECOM-3517) Avail: NTIS CSCL 09/1

A computer program was designed to calculate braid parameters for coaxial cable such as percent coverage, fill factor, angle, attenuation factor (Kb). Data is provided over a range of carriers, picks, ends, strand diameter, and diameter over the dielectric. Author (GRA)

N72-33215# Sanders Associates, Inc., Nashua, N.H.
HIGH VOLTAGE ARC INTERRUPTION STUDY Final Report, Dec. 1970 - Dec. 1971
A. Scott Gilmour and D. L. Lockwood Griffiss AFB, N. Y. RADC Apr. 1972 74 p refs Prepared by State Univ. of New York at Buffalo
(Contract F30602-69-C-0294)
(AD-744836; RADC-TR-72-40) Avail: NTIS CSCL 09/1

In 1968 it was observed by the authors that an axial magnetic field applied to a vacuum-arc discharge in a coaxial diode was capable of extinguishing the discharge. A continuing effort to develop a high-voltage dc arc interrupter has resulted in a device capable of interrupting 300 amperes at 15 kilovolts. This device has been operated at repetition frequencies of several pulses per second. Over 300 pulses per second have been achieved at low power levels. The turn-on and turn-off times are, respectively, one and two microseconds. The pulse width is variable from about two to several hundred microseconds. Operation at voltages above 15 kilovolts has been prevented, primarily, by anode spots. With improved materials and vacuum techniques and modified geometries, operating voltages far above 15 kV should be possible. One of the uses for the interrupter is expected to be in high-power modulators. Author (GRA)

N72-33216# Vermont Univ., Burlington. Dept. of Electrical Engineering.
TIME DOMAIN IMPULSE ANTENNA STUDY Final Report,

1 Sep. 1971 - 29 Feb. 1972
Morris Handelsman Griffiss AFB, N. Y. RADC May 1972 187 p refs
(Contract F30602-71-C-0278)
(AD-744837; RADC-TR-72-105) Avail: NTIS CSCL 09/5

The final report contains the results of an investigation to use the concepts of radiation from accelerating charges to develop the radiation characteristics of pulse-excited antennas in the time domain. The transition to antennas is accomplished through derivation of a radiation equation involving the time-derivative of the antenna currents. For sinusoidal time variation this equation reproduces well-known results for a number of common antennas. For pulse-excited linear antennas, the radiation equation produces a result derived previously by retarded potential and other methods. Numerical comparison with a published frequency-domain analysis of a pulsed dipole shows reasonable agreement except for angles close to the end-fire direction. Author (GRA)

N72-33217# Naval Avionics Facility, Indianapolis, Ind.
ANALYSIS AND DESIGN OF A NON-CONTACT POTENTIOMETER
Thomas E. Higbie 5 Apr. 1972 156 p refs
(AD-744627; NAFI-TR-1728) Avail: NTIS CSCL 09/1

The report describes the effort to develop an optical potentiometer. A summary of a theoretical analysis (TR-1364), on which much of the work is based, is presented. Work done in FY 69 and FY 70 is also summarized and work in FY 71 is detailed. The theoretical and practical problems, and solutions are discussed. Areas covered in detail are the photoelement, light/lens system, mechanical, and electrical interfacing. Drawings and fabrication steps are enclosed detailing the FY 71 model. Recommendations for improvement of future models are made. Author (GRA)

N72-33218# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
BINARY-ADDRESSABLE SCAN-CONVERSION STORAGE TUBE Quarterly Report, 15 Jan. - 15 Apr. 1972
Dickron Mergerian, Jon W. Ogland, Haden J. Bourg, and Igor Limansky May 1972 44 p
(Contract DAAB07-72-C-0052)
(AD-744796; ECOM-0052; QR-2) Avail: NTIS CSCL 09/1

The objective of the contract is to conduct a research and development program leading to the fabrication, testing, and delivery of a binary-addressable scan-converter storage tube. The tube is to be capable of simultaneous write and nondestructive read operation at video frequency up to 10 megahertz. Experiments were performed for producing the hole-array, consisting of 512 x 512 holes, 0.001-inch in diameter on 0.003-inch centers, in silicon wafers. Both photoanodic etching and laser drilling were explored. The designs for the contact strip arrangements on the disks were finalized, and the various fixtures were manufactured for control of photo-resist exposure and for securing registry of the hole-arrays of the sequence of digitizer-disks. Author (GRA)

N72-33219# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
HEAT TRANSFER AND ATTRITION PROCESSES AT THE ANODE OF PULSED HIGH INTENSITY ARCS Final Report, 16 Jun. 1970 - 15 Dec. 1971
J. L. Smith, E. Pfender, and E. R. G. Eckert Mar. 1972 53 p refs
(Contract F33615-70-C-1668; AF Proj. 7063)
(AD-744702; ARL-72-0025) Avail: NTIS CSCL 09/1

Tests of a high current pulsed arc with the intent to investigate anode erosion characteristics are described. The range of arc parameters covers currents from 5000 to 10,000 amps (square pulse) with time intervals from (20 to 200) x 10 to the minus 6th power. The arc is designed to be stationary; i.e., there are no external magnetic fields and the arc configuration produces self-magnetic fields which are symmetric so as not to move it. Spectrometric investigations reveal that there is no anode vaporization for the range of parameters investigated. A computer program is described for solving the one-dimensional problem of a constant heat flux impinging on a surface of a material with temperature dependent properties with a liquid-solid interface penetrating the material. Author (GRA)

N72-33220# Aerospace Corp., El Segundo, Calif. Lab. Operations.
PROPERTIES OF GaAs SCHOTTKY BARRIER MIXERS AT 3.3 MM Technical Report, Jun. 1969 - Jun. 1970
Robert D. Etcheverry, Walter A. Johnson, and Tsutomu T. Mori 30 May 1972 62 p refs
(Contract F04701-71-C-0172)
(AD-744819; TR-0172(2230-20)-12; SAMSO-TR-72-123) Avail: NTIS CSCL 09/1

Design and performance data are given for a 3.3 mm broadband mixer employing GaAs Schottky barrier diodes. Included are conversion loss and noise temperature ratio measurements on a series of mixers. Both single-ended and balanced configurations are considered. Author (GRA)

N72-33221# Admiralty Surface Weapons Establishment, Portsmouth (England).
A LARGE APERTURE ANTENNA FOR PROPAGATION STUDIES AT 16 GHz
J. McDougall Mar. 1972 23 p ref
(AD-743329; ASWE-TR-72-9; BR-29236) Avail: NTIS CSCL 09/5

The note describes the design, construction and testing of an Antenna with a very narrow vertical beam. Details of the propagation trials site are also included. Author (GRA)

N72-33222# Admiralty Surface Weapons Establishment, Portsmouth (England).
A SIMPLE WIDE BAND OMNI DIRECTIONAL ANTENNA
A. C. Large Jan. 1972 14 p refs
(AD-743328; ASWE-TR-72-6; BR-29164) Avail: NTIS CSCL 09/5

A compact vertically polarized antenna design based on a parabolic reflector is described. The antenna maintains omni-directional patterns (to within plus or minus 1 dB) over a 33% band from 7.5 to 10.5 GHz. The measured gain at 8.5 GHz was 8.1 dB. A simple modification that converts the antenna to horizontal polarization is also described. Author (GRA)

N72-33223# Radio Corp. of America, Princeton, N.J. Electronic Components.
GUNN EFFECT MICROWAVE POWER SOURCE Final Report, 1 Mar. 1971 - 29 Feb. 1972
S. Yegna Narayan and John P. Paczkowski Jun. 1972 66 p refs
(Contract DAAB07-71-C-0135; DA Proj. 1S6-62705-A-056)
(AD-745210; ECOM-0135-F) Avail: NTIS CSCL 09/5

An integral heat sink technology for the fabrication of high efficiency transferred electron oscillators was successfully developed. Using this technology, typical device efficiencies were increased from between 3 and 5% to between 6 and 9%. The best efficiency obtained was 14%, the highest efficiency reported to date for cw TEOs. The highest power output obtained from a single mesa device was 400 mW. The best power output-efficiency combination was 305 mW with 9% efficiency in X-band. A thermal analysis of a typical TEO structure was carried out. The influence of various device design parameters such as heat sink configurations, and nl product on device efficiency were studied. Author (GRA)

N72-33224# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
PROXIMITY EFFECTS FOR PARALLEL RECTANGULAR

CONDUCTORS IN NON-TRANSMISSION LINE MODE
Robert W. Burton Feb. 1972 37 p refs
(Contract N00014-67-A-0298-0005; NR Proj. 371-016)
(AD-743908; TR-629) Avail: NTIS CSCL 20/3

In applications of electrically short antennas such as multiturn loops, variation in ohmic losses due to proximity effects can significantly affect uncorrected estimates of efficiency. The paper investigates experimentally the proximity effects on the current distributions and associated ohmic losses for two identical parallel rectangular cross-section conductors as a function of separation distance and cross-section. The system is operated in a non-transmission-line mode. In the light of experimental results a first-order theory is developed and verified for analyzing relative proximity effects at the extremes of conductor separation distances. Author (GRA)

N72-33225# Raytheon Co., Bedford, Mass. Missile System Div.
HEMISPHERIC SCAN COVERAGE STUDY Final Summary Report, Jan. 1970 - Dec. 1971
Quirino Balzano Feb. 1972 14 p refs
(Contract F19628-70-C-0226; AF Proj. 4600)
(AD-743932; BR-6862; AFCRL-72-0127) Avail: NTIS CSCL 09/5

The objective is to investigate techniques for achieving hemispheric scan coverage by means of a phased array of elements flush mounted on a cylindrical surface. The studies included a theoretical investigation and an experimental program, the latter having the purpose of verifying the results of the analysis. The theoretical investigation has brought general methods of analyzing infinite periodic and finite cylindrical arrays. The experimental program has proved that the analytical methods give results in close agreement with experimental measurements. Author (GRA)

N72-33226# Army Electronics Command, Fort Monmouth, N.J.
FERRITE ROD ANTENNA ARRAYS FOR LORAN-C RECEIVERS
Kurt Ikrath Jun. 1972 74 p refs
(DA Proj. 1H6-62701-A-448)
(AD-745097; ECOM-3574) Avail: NTIS CSCL 09/5

The use of a small ferrite antenna array is shown theoretically to be superior in performance to the whip antenna supplied with a PSN-4 Loran-C receiver manpack set. While the paper is overall theoretical in nature, the theoretical results and conclusions have been verified in subsequent limited experimentation. Initial test with a compact ferrite rod antenna array in place of a whip showed that the time for acquisition of Loran-C time coordinates with the PSN-4 set is reduced to about one third the time it takes with a 15 foot long whip. Author (GRA)

N72-33227# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.
THE 1.8-1 BANDWIDTH UHF 3 X 3 ARRAY OF CROSSED OPEN-SLEEVE DIPOLES Technical Report, Jul. - Nov. 1971
Howard E. King and Jimmy L. Wong 30 Jun. 1972 53 p refs
(Contract F04701-72-C-0073)
(AD-745577; TR-0073(3404)-1; SAMSO-TR-72-178) Avail: NTIS CSCL 09/5

A circularly polarized nine-element (3 x 3) planar array antenna system has been evaluated for use on a synchronous satellite. The array elements are mounted on a 104-in. square reflector, and the basic radiating element is a crossed open-sleeve dipole with good VSWR and pattern characteristics over a 1.8:1 frequency band (225 to 400 MHz). The electrical performance of the antenna was measured using a half-scale model. It is shown that the antenna can provide an EOE gain (gain in the direction of the edge-of-the-earth) of greater than 14 dB from 225 to 250 MHz and greater than 11 dB from 250 to 400 MHz, based on the results of the half-scale model measurements. The measured axial ratio is less than 1.6 dB throughout the entire operating frequency band. Author (GRA)

N72-33228# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
REACTOR FAULT RELAY: DEVELOPMENT AND FIELD TESTS
L. E. Eilts and G. W. Cleveland Mar. 1972 34 p
(PB-210028; REC-ERC-72-11) Avail: NTIS HC $3.00 CSCL 09A

An overvoltage relay is described which has high sensitivity and rapid speed of operation for detecting the neutral overvoltage associated with internal faults in air core shunt reactors. Design features and development of the relay, and numerous results from tests conducted at a typical reactor installation, are presented. The relay demonstrated successful detection of simulated layer-to-layer reactor faults in about one cycle and sufficient immunity to false operation during the test series to be left in service for further evaluation. A comparison between present reactor protection and that afforded by the new relay is illustrated. Author (GRA)

N72-33229# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
INVESTIGATION OF CHARACTERISTICS AND PRACTICAL IMPLEMENTATION OF ARBITRARILY POLARIZED RADIATORS IN SLOT ARRAY Final Report, 1 Jan. 1970 - 15 Apr. 1972
James S. Ajioka, Dick M. Joe, Raymond Tang, and Nam S. Wong 28 Apr. 1972 84 p refs
(Contract F19628-70-C-0142; AF Proj. 4600)
(AD-745201; FR-72-14-503; AFCRL-72-0289) Avail: NTIS CSCL 09/5

The feasibility of the method of obtaining arbitrary polarization in both one and two-dimensional waveguide slot arrays was demonstrated. The arbitrarily polarized radiating element consists of a pair of cross slots which are cut in the sidewall of a bifurcated rectangular waveguide. Vertical and horizontal polarizations are excited by the sum and difference modes, respectively, in the bifurcated waveguide. By super-imposing the sum and difference modes in the proper amplitude and phase, any arbitrary polarization can be synthesized. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N72-33230* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACTIVE TUNED CIRCUIT Patent
Leonard L. Kleinberg, inventor (to NASA) Issued 19 Sep. 1972 9 p Filed 18 Jan. 1971 Supersedes N71-24902 (09-13, p 2060)
(NASA-Case-GSC-11340-1; US-Patent-3,693,105; US-Patent-Appl-SN-107379; US-Patent-Class-330-12; US-Patent-Class-331-115; US-Patent-Class-331-116R; US-Patent-Class-333-80T) Avail: US Patent Office CSCL 09C

Active tuned circuit configurations are described which are particularly suitable for microelectronic construction as filters, amplifiers, and oscillators for operation near the F sub t of the transistors employed. A high-Q, tunable network at a frequency near F sub t is provided by coupling a second bipolar transistor configuration to the emitter of a first bipolar transistor in order to provide negative resistance and capacitive reactance as necessary to tune the low Q inductive value of the first bipolar transistor. Official Gazette of the U.S. Patent Office

N72-33231*# Electronic Communications, Inc., St. Petersburg, Fla.
AUXILIARY ENGINE DIGITAL INTERFACE UNIT (DIU) Final Report

Aug. 1972 114 p refs
(Contract NAS8-27323)
(NASA-CR-123905) Avail: NTIS HC $7.75 CSCL 09C

This auxiliary propulsion engine digital unit controls both the valving of the fuel and oxidizer to the engine combustion chamber and the ignition spark required for timely and efficient engine burns. In addition to this basic function, the unit is designed to manage it's own redundancy such that it is still operational after two hard circuit failures. It communicates to the data bus system several selected information points relating to the operational status of the electronics as well as the engine fuel and burning processes. Author

N72-33232*# North American Rockwell Corp., Los Angeles, Calif. Space Div.
PHASE DETECTION SYSTEM FOR ac POWER LINES Patent Application
Wing J. Wong, inventor (to NASA) Filed 29 Sep. 1972 12 p
(Contract NAS9-150)
(NASA-Case-MSC-17832-1; US-Patent-Appl-SN-293727) Avail: NTIS HC $3.00 CSCL 09C

A phase protection system is provided for protecting phase-sensitive loads from being or remaining connected to ac power lines whenever a phase reversal occurs. It comprises a solid state phase detection circuit, a dc power relay circuit, an ac-to-dc converter for energizing the relay circuit, and a bistable, 4-terminal transducer coupled between the phase detection circuit and the power relay circuit, for controlling both circuits. NASA

N72-33233*# National Aeronautics and Space Administration, Washington, D.C.
GENERAL THEORY OF DYNAMIC SYSTEMS AND CLASSICAL MECHANICS
A. N. Kolmogorov Jun. 1972 34 p refs Transl. into ENGLISH from Proc. Intern. Congr. of Mathematicians, Amsterdam, 1954, v. 1 Amsterdam, North-Holland Publishing Co., 1957 p 315-333
(NASA-TT-F-14429) Avail: NTIS HC $3.75 CSCL 09C

General ideas of modern ergodic theory for the equalitative analysis of motion in analytic and specifically canonical dynamic systems are discussed. The stable capacities, two dimensional torus, and noncompactness are also considered, along with transitive measures, spectra, and eigenvalues of analytic systems. J.A.M.

N72-33234# Joint Publications Research Service, Arlington, Va.
QUALITY CRITERIA FOR THE DESIGN OF DISCRETE-ACTION MICROELECTRONIC DEVICES
V. N. Ustyuzhaninov 29 Sep. 1972 9 p refs Transl. into ENGLISH from Izv. Vuzov SSSR, Radioelektronika (Kiev), v. 15, no. 6, 1972 p 699-704
(JPRS-57142) Avail: NTIS HC $3.00

A quantitative measure of the structural complexity of microelectronic equipment functional diagrams in logic type digital computers is studied. The relation between the structural complexity of the functional diagram and design criteria of microelectronic devices is determined. Author

N72-33235# Joint Publications Research Service, Arlington, Va.
CALCULATING THE SPREADING RESISTANCE OF LINEARLY POLARIZED ELECTRODES
Yu. Ya. Iossel and R. A. Pavlovskiy 3 Oct. 1972 12 p refs Transl. into ENGLISH from Elektrichestvo (Moscow), no. 9, 1967 p 30-34
(JPRS-57163) Avail: NTIS HC $3.00

A discussion is presented for calculating the spreading resistance of electrodes connecting a direct current with a conducting medium. The problem of calculating the spreading resistance of linearly polarized electrodes when they have the form of plates or are bounded by plane surfaces is considered. Author

N72-33236# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy). Lab. Nazionali di Frascati.
ELECTRIC LOSSES IN CONDUCTORS AND SUPERCONDUCTORS EXCITED BY STEPWISE VOLTAGE
P. DelVecchio, G. Sacerdoti, and G. M. Veca 17 Nov. 1971 44 p refs In ITALIAN
(LNF-71/75) Avail: AEC Depository Libraries

The thermal and electrical properties of superconductors in common use at 4.2 K were investigated to determine the influence of copper on the cooling effectiveness. It was found: (1) The thermal conductivity of superconductors is very small compared to that of copper. (2) The coefficient of thermal diffusion for copper is much higher than for various superconductors. (3) The coefficient of magnetic diffusion is much higher for superconductors than for copper. The effect of various geometries on magnetic dispersion is analyzed. Transl. by F.O.S.

N72-33237# Institute of Nuclear Research, Warsaw (Poland).
DIGITAL CHARGE INTEGRATOR
Stanislaw Glowacki 1971 21 p refs In POLISH; ENGLISH summary
(INR-1331) Avail: AEC Depository Libraries

The electronic circuits employed in the measurement of electric charge are described. The charge can be delivered to the input of the converter in the form of electric current varying in the range from ten to the minus nine power A to the ten to the minus three power A, without need for switching. The integrator consists of two parts: a charge-to-pulse converter and a ten to the seventh power counts sealer. If the amount of scaled pulses is equal to the previously adjusted value, the signaling circuits are started. The required number of counts can be chosen in the range from 1 to 9,999,999 pulses. Author (NSA)

N72-33238# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEW RESULTS ON THE EFFECT OF RADIATIONS ON ELECTRONIC AND ELECTROTECHNICAL MATERIALS AND DEVICES
George Ionescu and Vasile Fochianu 10 Apr. 1972 22 p refs Transl. into ENGLISH from Electrotehnica (Rumania), v. 17, no. 6, 1969 p 232-240
(AD-743659; FTD-HC-23-2004-71) Avail: NTIS CSCL 09/3

The results obtained in irradiation tests of electronic devices are summarized. The behavior of various components of the assembled units is also reviewed. Author (GRA)

N72-33239# Radio Corp. of America, Princeton, N.J.
OPTICALLY CONTROLLED (PMOS P-METAL OXIDE SEMICONDUCTORS) CIRCUITS Final Report, 1 Jan. 1968 - 29 Feb. 1972
Walter F. Kosonocky Mar. 1972 52 p refs
(Contract F19628-69-C-0128; AF Proj. 4641)
(AD-743949; PRRL-72-CR-14; AFCRL-72-0248) Avail: NTIS CSCL 09/5

Design and experimental data are presented on the operation of basic cells for optically modifiable PMOS logic arrays and for three different types of optically loadable PMOS memory cells. The experimental data obtained in the study of the operation of the optically modifiable logic cells and the symmetrical, optically loadable, memory cell (having only one photodiode) showed that, for reliable detection, the optical signal required corresponds to a photogenerated charge in the range of 1 to 5 pC. However, a balanced, or symmetrical, digital light sensor can be more sensitive by two orders of magnitude, requiring detected charge signal of 0.05 to 0.01 pC. Experimental data are presented on the operation of asynchronous PMOS photosensors applicable to detection of continuous optical signals that employ charge-pumping for biasing of the photodiodes. Author (GRA)

N72-33240# Harry Diamond Labs., Washington, D.C.
FIELD COUPLING PARAMETERS FOR A SINGLE ROUND WIRE CLOSE TO A GROUND PLANE OF TWO LARGE

ROUND WIRES IN FREE SPACE
Sidney Frankel Apr. 1972 17 p
(HDL Proj. E05E6)
(AD-744774; HDL-TM-72-14) Avail: NTIS CSCL 09/1

The TEM response of a conventional two-conductor transmission line to an external electromagnetic field is characterized by certain quantities termed magnetic and electric field coupling parameters. Values of these parameters for a line consisting of two small round conductors, or one small conductor above an infinite ground plane, have been determined previously. The report obtains simple expressions for the parameters when the round conductors are of arbitrary, but equal, radius. The error incurred in assuming the small-wire approximation is tabulated in the range 1.1 < or = rho < or = 10, where rho is the height/radius ratio of the single conductor above ground, or the spacing/diameter ratio of the two equal equi-radius conductors. Author (GRA)

N72-33241# Illinois Univ., Urbana. Dept. of Physics.
ELECTRONIC PROPERTIES OF SOLID SURFACES Final Report
Charles B. Duke Jul. 1972 14 p refs
(Grant AF-AFOSR-2034-71; AF Proj. 9761)
(AD-745138; AFOSR-72-1184TR) Avail: NTIS CSCL 20/12

A new theory of elastic and inelastic low-energy-electron diffraction has been constructed, shown to describe all major features of experimental measurements, and applied to extract from such measurements the geometrical, vibrational, and electronic structure of the low-index faces of aluminum. Author (GRA)

N72-33242# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
[ELECTRICAL ENGINEERING RESEARCH IN THEORY AND DEVICES] Annual Research Summary, 1971
1971 209 p refs
(PB-209561) Avail: NTIS HC $3.00 CSCL 09A

Electrical engineering research in theory and equipment is reported. Data cover automatic controls, bioengineering, circuits and systems, and communication equipment. Also covered are computers and automata, electromagnetic fields, energy sources and systems, and solid state devices and materials. GRA

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N72-33243*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
DESIGN, FABRICATION AND DELIVERY OF AN IMPROVED SINGLE ELASTIC LOOP MOBILITY SYSTEM (ELMS) Executive Summary Report
W. Trautwein Jun. 1972 42 p refs
(Contract NAS8-27737)
(NASA-CR-123840; HREC-7737-1; LMSC/HREC-D225600-1) Avail: NTIS HC $4.25 CSCL 13F

Several significant design improvements have been incorporated into the second-generation full-scale ELMS unit. A major improved design accomplishment was the increase of the load carrying capacity of elastic loops without severe weight or stress penalties. Redesign of the loop form and size, plus selection of a more advanced titanium alloy, resulted in performance characteristics representing a marked improvement over the first-generation unit. Another important design improvement was the shaping of the loop's footprint into a favorable form for uniform pressure distribution. Other improvements are associated with a more efficient drive torque transmission from the internal drive drums to the elastic loop which are expected to reduce the internal losses of the drive system. The new ELMS unit will be capable of being integrated, on a modularized basis, with a multi-loop articulated ELMS test vehicle as the next logical step in the development of the mobility concept. Author

N72-33244*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
DESIGN, FABRICATION AND DELIVERY OF AN IMPROVED SINGLE ELASTIC LOOP MOBILITY SYSTEM (ELMS). VOLUME 2: TECHNICAL REPORT
W. Trautwein Jul. 1972 142 p refs
(Contract NAS8-27737)
(NASA-CR-123841; HREC-7737-2-Vol-2; LMSC/HREC-D225600-2-Vol-2) Avail: NTIS HC $9.25 CSCL 13F

N72-33245*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WIND SENSITIVITY STUDIES OF A NON-RETURN WIND TUNNEL, WITH A 216- BY 432-mm (8.5- BY 17.0-INCH) TEST SECTION, PHASE 1
William T. Eckert, Kenneth W. Mort, and J. E. Piazza Sep. 1972 106 p refs Sponsored in part by Army Air Mobility Res. and Develop. Lab.
(NASA-TM-X-62171) Avail: NTIS HC $7.50 CSCL 14B

The study to develop inlet and exit treatments which would minimize the effect of external wind on the test-section flow quality of a nonreturn wind tunnel is reported. The investigation was conducted in the Ames Research Center 40- by 80-Foot Wind Tunnel which served as the wind source. Several inlets and two exits were tested at wind directions ranging from 0 to 180 degrees and at wind-to-test-section velocity ratios between zero and one. For the best inlet configuration the flow quality was good, with a velocity deviation in each of the three directions generally less than 1/2 knot (0.26 m/sec) for wind velocities of 15 knots (7.7 m/sec) or less. The loss in total pressure due to the inlet treatment was low: about 0.03 of the test-section dynamic pressure. Author

N72-33246*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FULL SCALE SUBSONIC WIND TUNNEL REQUIREMENTS AND DESIGN STUDIES
Mark W. Kelly, Kenneth W. Mort, and David H. Hickey Sep. 1972 50 p refs
(NASA-TM-X-62184) Avail: NTIS HC $4.50 CSCL 14B

The justification and requirements are summarized for a large subsonic wind tunnel capable of testing full-scale aircraft, rotor systems, and advanced V/STOL aircraft propulsion systems. The design considerations and constraints for such a facility are reviewed, and the trades between facility test capability and costs are discussed. The design studies showed that the structural cost of this facility is the most important cost factor. For this reason (and other considerations such as requirements for engine exhaust gas purging) an open-return wind tunnel having two test sections was selected. The major technical problem in the design of an open-return wind tunnel is maintaining good test section flow quality in the presence of external winds. This problem has been studied extensively, and inlet and exhaust systems which provide satisfactory attenuation of the effects of external winds on test section flow quality were developed. Author

N72-33247# Joint Publications Research Service, Arlington, Va.
MISSILE GROUND EQUIPMENT
V. G. Malikov, S. F. Komisarik, and A. M. Korotkov 17 Oct.

1972 307 p refs Transl. into ENGLISH of the book "Nazemnoye Oborudovaniye Raket" Moscow, Order of the Labor Red Banner Mil. Publishing House, 1971 304 p
(JPRS-57270) Avail: NTIS HC $17.50

The design and operational principles of launch, transportation, erection, and fueling equipment for ballistic missiles are discussed. Author

N72-33248*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK, VOLUME 11 Progress Report, Jul. - Aug. 1972
15 Oct. 1972 178 p refs
(Contract NAS7-100)
(NASA-CR-128411; JPL-TR-32-1526-Vol-11) Avail: NTIS HC $11.00 CSCL 22D

Deep Space Network progress in flight project support, Tracking and Data Acquisition research and technology, network engineering, hardware and software implementation, and operations are presented. Material is presented in each of the following categories: description of DSN; mission support; radio science; support research and technology; network engineering and implementation; and operations and facilities. Author

N72-33249# Stanford Linear Accelerator Center, Calif.
DESCRIPTION AND PHYSICS PROGRAM OF THE PROPOSED RECIRCULATING LINEAR ACCELERATOR (RLA)
Feb. 1972 78 p refs Revised
(Contract AT(04-3)-515)
(SLAC-139-Rev) Avail: NTIS

A method of approximately doubling the energy of the SLAC accelerator by recirculation of the beam and reinjection into the machine for a second pass is described. The recirculator could also be used for high duty cycle (up to 6 percent) experiments at the recirculating energy by storing the beam and extracting about 1 percent of the electrons per revolution. Recirculation will initially occur at an energy of 17.5 Gev. Beam losses of approximately 125 MeV due to synchrotron radiation would be compensated by 2 sectors (666 ft) of standard accelerator sections operating at the accelerator frequency (2856 MHz). These sectors will be pulsed at a repetition rate of 43,500 pulses per second corresponding to the recirculating period of about 23 microseconds. The beam will be stored for 2.8 milliseconds (approximately 122 revolutions around the 6900 meter storage path); this is the time interval between the normal pulses of the accelerator. Author (NSA)

N72-33250# California Univ., Berkeley. Lawrence Berkeley Lab.
EXTERNAL BEAM OF THE BERKELEY 184-INCH SYNCHROCYCLOTRON
Arthur C. Paul 24 Nov. 1971 41 p refs
(Contract W-7405-eng-48)
(LBL-370) Avail: NTIS

The experimentally determined external beam properties of the main beam and satellite beam of the Berkeley 184-inch synchrocyclotron are discussed and compared to a computer model based on elliptical phase space contours. Reasonable agreement is found for the profile of both beams and the relative centroid positions. The starting conditions of the beams are tabulated at several useful locations along the beam line. Comparison is also made to the phase space contours calculated from an extraction study based on the cyclotron's magnetic field and betatron oscillation amplitudes. Author (NSA)

N72-33251# Argonne National Lab., Ill.
PARAMETERS AND PERFORMANCE CHARACTERISTICS OF THE 12 FOOT BUBBLE CHAMBER
K. Jaeger Mar. 1972 26 p refs Sponsored by AEC
(ANL/HEP-7210) Avail: NTIS

The chamber components and dimensions are described including liquid volume, optics system, expansion system, magnet, cryogenics, and the control room. Scanning and measuring of the bubble chamber film is discussed, and an overall view of the existing, planned, and contemplated beams for the bubble chamber is shown. NSA

N72-33252# Addis Translations International, Woodside, Calif.
BEAM FOCUSING IN THE ELECTRON GUIDE OF A COLLECTIVE-ACCELERATOR MODEL
A. P. Belyaev and P. I. Ryltsev Mar. 1972 34 p refs Transl. into ENGLISH of Russian report JINR-P9-6081 In ENGLISH and RUSSIAN Prepared for Calif. Univ., Berkeley. Lawrence Berkeley Lab. Sponsored by AEC
(UCRL-Trans-1470; JINR-P9-6081) Avail: NTIS

Calculations are reported on the focusing system of the electron guide of a collective accelerator model designed for electron beam transport at a beam current of 50 to 150 A, energy of 1.5 to 2.5 MeV, and emittance of 20 to 100 mrad cm. Focusing is achieved with the aid of magnetic lenses. Graphs of beam envelopes in the drift gaps are given, together with the magnetic fields on the guide axis and the disposition of the focusing lenses under various accelerator operating conditions. Author (NSA)

N72-33253# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EVAPORATION AND COMBUSTION OF THE AERODISPERSED SYSTEMS
V. A. Fedoseev 31 Mar. 1972 24 p Transl. into ENGLISH from Fiz. Aerodispersnykh Sist. (Kiev), no. 1, 1969 p 86-100
(AD-743649; FTD-MT-24-1245-71) Avail: NTIS CSCL 14/2

A description of an experimental facility where the evaporation or combustion of a particle takes place in a stream of hot air and appears as a luminous trace to the observer is given. The facility makes it possible to determine such evaporation or combustion of droplets and particles, the induction period of preignition processes, mass and heat transfer characteristics, the influence of the temperature of the medium on the combustion rate, the influence of a gas medium and of various additions to the air, the completeness of combustion products, the emission of individual particles and of particle groups, the influence of catalytic additions and impurities, and the combustion of aerosols. Author (GRA)

N72-33254# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
PERFORMANCE TRIALS OF THE EIGHT-INCH DIAMETER UTIAS IMPLOSION-DRIVEN HYPERVELOCITY LAUNCHERS Mk 2 AND Mk 3
S. K. Chan, G. Cappelli, and W. O. Graf Feb. 1972 121 p refs
(Contract AF 33(615)-5313; AF Proj. 7065)
(AD-744699; UTIAS-TN-161; ARL-72-0035) Avail: NTIS CSCL 14/2

An experimental investigation of the performance of the 8-inch diameter MK-2 and MK-3 UTIAS Implosion-Driven Hypervelocity Launchers was carried out. Many problems were encountered in the operation of this unique device such as off-centre implosions, projectile integrity, preparation of the hemispherical explosive-liner package and the erratic operation of the velocity measuring system. Detailed descriptions of the solutions were presented. An investigation of a technique of initiating the PETN liner by light sensitive explosives was carried and is presented in Appendix A. The possibility of measuring the velocity and acceleration of the projectile in the launcher barrel using a laser interferometer technique was investigated and is reported in Appendix B. Appendix C is a summary of the work carried out on the MK 1 launcher. Author (GRA)

N72-33255# Stanford Research Inst., Menlo Park, Calif.
AIRCRAFT GROUND FIRE SUPPRESSION AND RESCUE SYSTEMS: BASIC RELATIONSHIPS IN MILITARY FIRES Interim Report, 12 Jan. - 1 Sep. 1971

Ray S. Alger and Erwin L. Capener Apr. 1972 142 p refs
(Contract N60971-71-C-0283)
(AD-745122; AGFSRS-72-1) Avail: NTIS CSCL 13/2

Experimental pool fires of JP5 3 ft and 10 ft in diameter were instrumented to measure heat fluxes, burning rates, and suppression characteristics. Test substrates included water, sand and gravel. In these tests the extinguishment system was designed to give a uniform rate of application over the burning fuel surface. The suppressant spray was characterized as to uniformity, average drop size, and interaction kinetics with the fuel surface. Radiation fluxes at varying distances from the fire were related to wind velocity, location of measuring station, type of substrate and the water content of the substrate. Fuel burning rates were related to wind velocity and substrate characteristics. Site preparations are described for 100 ft x 100 ft fires.

Author (GRA)

N72-33256# Federal Aviation Administration, Washington, D.C. Airports Service.
EFFINGHAM COUNTY MEMORIAL AIRPORT, EFFINGHAM, ILLINOIS Final Environmental Impact Statement
1 May 1972 36 p Supersedes PB-205790-D HC $3.00
(PB-205790-F; PB-205790-D; ELR-4355) Avail: NTIS CSCL 13B

A description is given of the proposal for further development of the Effingham County Memorial Airport for land reimbursement and acquisition, construction marking, and lighting of a crosswind runway. There will be no primary adverse environmental effects other than land use.

Author (GRA)

N72-33257# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE JOINT OPERATION OF A HEAVY CURRENT ELECTRODYNAMIC PLASMA ACCELERATOR WITH A SOURCE OF ELECTRIC POWER SUPPLY IN THE FORM OF SINGLE-PHASE SALIENT-POLE MAGNETO-ELECTRIC GENERATOR
P. M. Kolesnikov and N. N. Stolovich 28 Jan. 1972 52 p refs
Transl. into ENGLISH from unidentified Russian publ., Minsk, Izd-vo Nauka i Tekhn., 1970 p 106-149
(AD-745469; FTD-MT-24-1309-71) Avail: NTIS CSCL 10/2

A study is made of the joint operation of a heavy-current plasma accelerator with a capacitance accumulator and energizer in the form of a single-phase salient-pole magneto-electric generator. The flow of plasma in the coaxial chamber depends on the moment of connection of the accelerator to the energy accumulator and the parameters of the discharging and charging circuits. With the connection of a capacitor with a capacitance of 150-200 mu F at n equals 1000-3000 rpm the capacitor can be charged in 0.001-0.002 s up to a voltage of 1-10 kV.

Author (GRA)

N72-33258# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
CONDITION SURVEY, SHERMAN ARMY AIRFIELD, FORT LEAVENWORTH, KANSAS
P. J. Vedros and R. D. Jackson Jun. 1972 16 p
(AD-743912; AEWES-Misc-Paper-S-72-25) Avail: NTIS

The purpose of the report is to present the results of an inspection performed at Sherman Army Airfield (SAAF) in April 1971. The inspection was limited to visual observations, and no tests were conducted on any of the pavement facilities.

Author (GRA)

N72-33259# Naval Postgraduate School, Monterey, Calif.
DEVELOPMENT OF A FIXED BASE VISUAL APPROACH AND LANDING SIMULATOR M.S. Thesis
Richard Allen Gibson Mar. 1972 29 p refs
(AD-745200) Avail: NTIS CSCL 14/2

A fixed base visual approach and landing simulator was developed using an F-105 Canopy/Seat Cockpit Trainer, Panasonic Closed Circuit Television System, and a SMK-22 Main Attachment Unit. Difficulties encountered in interface of the units necessitated modification of the SMK-22 Attachment Unit in both flight characteristics and operating modes. A main control console was assembled to control and coordinate the operation of the system elements and monitor the system during simulated flight. Reduction in degrees of freedom was achieved through elimination of the yaw mode. An FJ-4 control stick was modified and installed in the cockpit replacing the fabricated control stick. Longitudinal trim control was achieved with the trim switch installed in the FJ-4 control stick, modifying longitudinal circuitry by means of an additional trim assembly.

Author (GRA)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N72-33260 Engineering Sciences Data Unit, London (England).
ISENTROPIC EXPANSION OF AIR FROM REST
Jul. 1971 3 p refs
(ESDU-00.03.05) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The boundary between subsonic and supersonic flow is indicated. It is assumed that air behaves as a perfect gas and that the expansion from pressure p sub H pressure p takes place isentropically according to the law p/(rho to the gamma-th power)= constant with gamma = 1.4.

Author

N72-33261 Engineering Sciences Data Unit, London (England).
INTRODUCTORY MEMORANDUM ON THE PRESSURE LOSSES IN INTERNAL FLOW SYSTEMS
Jul. 1969 34 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-69016) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Simplified methods of calculating pressure losses are considered. Some of the more general aspects of the estimation of pressure losses in ducted flow systems are discussed. The limitations are reviewed which practical factors impose on the precision with which calculations can be made, and conversion factors are presented for some of the quantities which appear in pressure loss calculations.

Author

N72-33262 Engineering Sciences Data Unit, London (England).
FLUID FORCES ON NON-STREAMLINE BODIES: BACKGROUND NOTES AND DESCRIPTION OF THE FLOW PHENOMENA
May 1971 31 p refs Sponsored by Roy. Aeron. Soc., Inst. of Chem Engr., Inst. of Mech. Engr., and Inst. of Struct. Engr.
(ESDU-71012) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Wind flow around bluff bodies such as buildings is considered, but the data is also applicable to other fluid flow problems, providing the Reynolds number is sufficiently high. The estimation of the mean flow component is discussed, as well as the fluctuating component estimation.

Author

N72-33263 National Lending Library for Science and Technology, Boston Spa (England).
MOLECULAR DIFFUSION
G. Meyer 7 Jun. 1972 27 p refs Transl. into ENGLISH from Houille Blanche (France), v. 3, 1969 p 219-227 In ENGLISH and FRENCH
(NLL-Windscale-494-(9091.9F)) Avail: Natl. Lending Library,

Boston Spa, Engl.: 3 NLL photocopy coupons

Present ideas are reviewed on the subject of local diffusion equations for a multicomponent flowing fluid. Binary isothermal diffusion is considered, in which the importance of strict definition of the diffusion coefficient for the chosen reference systems, concentration units, and flux is emphasized and the exact origin of the Stefan correction is shown. The most general problem is discussed stressing the mutual effects of diffusion, heat transfer, chemical reactions, and fluid stresses. These problems are considered from the irreversible phenomena thermodynamics angle. Author

N72-33264*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

BOUNDARY LAYER TRANSITION: A REVIEW OF THEORY, EXPERIMENT AND RELATED PHENOMENA

E. L. Kistler Feb. 1971 164 p refs

(Contract NAS9-5384)

(NASA-CR-128540; LEC-675-44-00450; Rept-1E4017) Avail: NTIS HC $10.25 CSCL 20D

The overall problem of boundary layer flow transition is reviewed. Evidence indicates a need for new, basic physical hypotheses in classical fluid mechanics math models based on the Navier-Stokes equations. The Navier-Stokes equations are challenged as inadequate for the investigation of fluid transition, since they are based on several assumptions which should be expected to alter significantly the stability characteristics of the resulting math model. Strong prima facie evidence is presented to this effect. Author

N72-33265*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

MEASUREMENTS OF THE STRUCTURE OF AN IONIZING SHOCK WAVE IN A HYDROGEN-HELIUM MIXTURE

Lewis P. Leibowitz 1 Sep. 1972 17 p refs

(Contract NAS7-100)

(NASA-CR-128343; JPL-TM-33-563) Avail: NTIS HC $3.00 CSCL 20D

Shock structure during ionization of a hydrogen-helium mixture was studied using hydrogen line and continuum emission measurements. A reaction scheme is proposed which includes hydrogen dissociation and a two-step excitation-ionization mechanism for hydrogen ionization by atom-atom and atom-electron collisions. Agreement was achieved between numerical calculations and measurements of emission intensity as a function of time for shock velocities from 13 to 20 km/sec in a 0.208 H2 - 0.792 He mixture. The electron temperature was found to be significantly different from the heavy particle temperature during much of the ionization process. Similar time histories for H beta and continuum emission indicate upper level populations of hydrogen in equilibrium with the electron concentration during the relaxation process. Author

N72-33266*# Brown Univ., Providence, R.I. Div. of Engineering.

INTERRELATED STRUCTURES OF THE TRANSPORT SHOCK AND COLLISIONAL RELAXATION LAYER IN A MULTITEMPERATURE, MULTILEVEL IONIZED GAS

Antonio R. Vinolo and Joseph H. Clarke Aug. 1972 57 p refs Sponsored in part by NASA and ESRO

(Grant NSF GK-31510)

(NASA-CR-128333; GK-31510/1) Avail: NTIS HC $5.00 CSCL 20D

The gas dynamic structures of the transport shock and the downstream collisional relaxation layer are evaluated for partially ionized monatomic gases. Elastic and inelastic collisional nonequilibrium effects are taken into consideration. Three electronic levels are accounted for in the microscopic model of the atom. Nonequilibrium processes with respect to population of levels and species plus temperature are considered. By using an asymptotic technique the shock morphology is found on a continuum flow basis. The asymptotic procedure gives two distinct layers in which the nonequilibrium effects to be considered are different. A transport shock appears as the inner solution to an outer collisional relaxation layer in which the gas reaches local equilibrium. A family of numerical examples is displayed for different flow regimes. Argon and helium models are used in these examples. Author

N72-33267# Advisory Group for Aerospace Research and Development, Paris (France).

EXPERIMENTS ON MANAGEMENT OF FREE-STREAM TURBULENCE

R. I. Loehrke (Ill. Inst. of Tech., Chicago) and H. M. Nagib (Ill. Inst. of Tech., Chicago) Sep. 1972 113 p refs

(AGARD-R-598) Avail: NTIS HC $7.75 CSCL 20D

The effects of various passive devices (screens, perforated plates, porous foam, and honeycomb-like matrices formed with closely packed plastic drinking straws) on free-stream turbulence and mean velocity profiles are studied in air with hot-wire anemometry and in water using hydrogen-bubbles visualization. These turbulence manipulators are viewed as operators which suppress the level of the incoming turbulence and generate, primarily through documented instabilities, new turbulence with scales characteristic of the device and its shear layers. For honeycombs, the suppression of the incoming turbulence appears to be mostly due to the inhibition of lateral components of the fluctuating velocity. For most devices, it is conjectured that part of the energy in the undersirable larger scales of motion drains away through the action of the Reynolds stresses of the smaller scale laminar and turbulent motions (including the instabilities). The performance of the manipulators is found to depend on the characteristics of the incoming turbulence including its frequency spectra, level, and spatial distribution and on the incoming mean flow profiles. The efficacy of devices generating large scale turbulences in smoothing out gross inhomogeneities in the mean velocity profiles is illustrated. Author

N72-33268*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NUMERICAL METHOD FOR THE SOLUTION OF LARGE SYSTEMS OF DIFFERENTIAL EQUATIONS OF THE BOUNDARY LAYER TYPE

Michael J. Green and Philip R. Nachtsheim Washington Oct. 1972 10 p refs

(NASA-TN-D-7068; A-4544) Avail: NTIS HC $3.00 CSCL 20D

A numerical method for the solution of large systems of nonlinear differential equations of the boundary-layer type is described. The method is a modification of the technique for satisfying asymptotic boundary conditions. The present method employs inverse interpolation instead of the Newton method to adjust the initial conditions of the related initial-value problem. This eliminates the so-called perturbation equations. The elimination of the perturbation equations not only reduces the user's preliminary work in the application of the method, but also reduces the number of time-consuming initial-value problems to be numerically solved at each iteration. For further ease of application, the solution of the overdetermined system for the unknown initial conditions is obtained automatically by applying Golub's linear least-squares algorithm. The relative ease of application of the proposed numerical method increases directly as the order of the differential-equation system increases. Hence, the method is especially attractive for the solution of large-order systems. After the method is described, it is applied to a fifth-order problem from boundary-layer theory. Author

N72-33269# Bureau of Mines, San Francisco, Calif. Energy Research Lab.

NUMERICAL METHODS FOR DETERMINING STREAMLINES AND ISOPRESSURES FOR USE IN FLUID FLOW STUDIES

R. V. Higgins and A. J. Leighton 1972 64 p

(BM-RI-7621) Avail: NTIS HC $5.25

A numerical method is presented to calculate the isopressure (isobar) lines and streamlines for an oilfield from the pressure distribution. A knowledge of these lines is useful in the study of

the flow of fluids in underground reservoirs, especially for those containing gaseous and/or liquid hydrocarbons. Computer methods are presented to calculate the streamlines and isopressures for any well-spacing pattern existing within a field with multiple wells. The method reproduces the flow net for several well configurations having extensive geometrical variations. Such information provides the petroleum engineer with data from which he can compute oil recoveries for different patterns and thereby maximize the recovery of hydrocarbons from the reservoir. Author

N72-33270*# Mississippi State Univ., State College. Dept. of Aerophysics and Aerospace Engineering.
IN-FLIGHT COMPARISONS OF BOUNDARY-LAYER AND WAKE MEASUREMENT PROBES FOR INCOMPRESSIBLE FLOW
Lawrence J. Mertaugh, Jr. Mar. 1972 72 p refs
(Grant NGR-25-001-036)
(NASA-CR-127488; AASE-72-74) Avail: NTIS HC $5.75 CSCL 20D

The results are presented of in-flight comparisons of a number of boundary-layer and wake measurement probes suitable for low-speed flight-test investigations. The tested boundary-layer probes included a traversing total-pressure probe and a hot-film probe mounted on an internally-mounted drive mechanism, a curved and a straight boundary-layer rake, and a traversing hot-film probe with an externally-mounted drive mechanism. The wake measuring devices included a traversing, self-aligning probe, a wake rake, and an integrating wake rate. The boundary-layer data are compared with a common reference velocity profile and comments given regarding the accuracy of the static-pressure and total-pressure measurements. Discussions on the various calibration presentations used with hot-wire and hot-film sensors and various aspects of improving the accuracy of hot-film sensor results are given in the appendix of this report. Author

N72-33271*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
A FINITE DIFFERENCE METHOD FOR PREDICTING SUPERSONIC TURBULENT BOUNDARY LAYER FLOWS WITH TANGENTIAL SLOT INJECTION
E. W. Miner and C. H. Lewis Washington NASA Oct. 1972 79 p refs
(Grant NGR-47-004-072)
(NASA-CR-2124) Avail: NTIS HC $3.00 CSCL 20D

An implicit finite difference method has been applied to tangential slot injection into supersonic turbulent boundary layer flows. In addition, the effects induced by the interaction between the boundary layer displacement thickness and the external pressure field are considered. In the present method, three different eddy viscosity models have been used to specify the turbulent momentum exchange. One model depends on the species concentration profile and the species conservation equation has been included in the system of governing partial differential equations. Results are compared with experimental data at stream Mach numbers of 2.4 and 6.0 and with results of another finite difference method. Good agreement was generally obtained for the reduction of wall skin friction with slot injection and with experimental Mach number and pitot pressure profiles. Calculations with the effects of pressure interaction included showed these effects to be smaller than effects of changing eddy viscosity models. Author

N72-33272*# Lockheed-Georgia Co., Marietta.
THREE DIMENSIONAL COMPRESSIBLE BOUNDARY-LAYER COMPUTATIONS FOR A FINITE SWEPT WING
J. F. Nash and R. M. Scruggs [1972] 120 p refs
(Contract NAS1-10823)
(NASA-CR-112158) Avail: NTIS HC $8.00 CSCL 20D

Three-dimensional, compressible turbulent boundary-layer calculations have been performed for the finite supercritical wing of the NASA modified F8 transonic research airplane. Data on the boundary-layer thickness, displacement thickness, skin friction components, and integrated streamwise skin friction are presented for points along the streamwise stations of which the pressure measurements were previously made. Representative velocity profiles are shown, and boundary-layer-thickness contour plots and skin-friction vector plots are presented. Results are given for a Reynolds number of 1.5 million per foot, and for Mach numbers of 0.50 and 0.99. Author

N72-33273# Imperial Coll. of Science and Technology, London (England). Dept. of Aeronautics.
AN INTRODUCTION TO CONDITIONAL SAMPLING OF TURBULENT FLOW
P. Bradshaw Aug. 1972 18 p refs
(IC-Aero-72-18) Avail: NTIS HC $3.00

Conditional sampling is a method of deriving statistical averages over only the interesting parts of a continuous time function, as distinct from conventional averages over infinite sample length. The choice of the interesting regions is entirely free: the simplest example is the turbulent part of an intermittent signal. Separate statistical averages are generated for the different regions. In cases where the sampling criteria or the required statistical averages are not well defined at the start of the experiment, digital analysis is usually preferable to analogue analysis at the site of the experiment, because of its greater flexibility. Conditional sampling is not a replacement for conventional averaging, but may provide more relevant information. Author (ESRO)

N72-33274# Addis Translations International, Woodside, Calif.
PROPAGATION OF SHOCK WAVES WITH SLIP
Yu. N. Vatolin Apr. 1971 8 p Transl. into ENGLISH from Chislennye Metody Mekh. Sploshnoi Sredy (USSR), v. 2, no. 5, 1971 p 111-114 Sponsored by AEC Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab.
(UCRL-Trans-10608) Avail: NTIS

Phenomenological models for determining the propagation shock waves with slip are presented. Data cover mass flux density, momentum flux density, and energy flux density on either side of the shock wave front in an ideal gas. E.H.W.

N72-33275# Addis Translations International, Woodside, Calif.
GROUP CLASSIFICATION OF IMPLICIT DIFFERENCE SCHEMES FOR A SYSTEM OF EQUATIONS IN GAS DYNAMICS
N. N. Yanenko and Yu. I. Shokin Apr. 1972 9 p refs Transl. into ENGLISH from Chislennye Metody Mekh. Sploshnoi Sredy (USSR), v. 2, no. 2, 1971 p 85-92 Prepared for Calif. Univ., Livermore. Lawrence Livemore Lab.
(UCRL-Trans-10605) Avail: NTIS

A great variety of difference schemes is used in practice for problems of gas dynamics, and it is therefore necessary to classify these methods in accordance with their dissipative properties. The method of the first differential approximation leads to a group classification of difference schemes. The first differential approximation retains sufficient information on the difference scheme and is, in fact, a differential equation so that the group theory of differential equations can be wholly applied. A group classification is given of two-layer difference schemes for a two-dimensional set of gas dynamic equations. A class of stable two-layer difference schemes of the same transformation group as the original gas dynamic set of equations is constructed. Author

N72-33276# Addis Translations International, Woodside, Calif.
CALCULATION OF THE UNSTEADY MOTIONS OF COMPRESSIBLE MEDIA WITH PHASE TRANSITIONS
V. F. Kuropatenko and A. T. Sapozhnikov Apr. 1972 16 p refs Transl. into ENGLISH from Chislennye Metody Mekh. Sploshnoi Sredy (USSR), v. 2, no. 5, 1971 p 93-105 Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab.
(UCRL-Trans-10607) Avail: NTIS

Problems connected with the motion of a medium containing equilibrium phase transitions are discussed. The inhomogeneous difference method is used to solve some of the problems. All calculations are based on the RAND program. Data presented cover characteristic features of unsteady motions, equations of state, and the results of one problem. Author

N72-33277# Addis Translations International, Woodside, Calif.
APPLICATION OF THE METHOD OF DIFFERENTIAL COUPLING TO ONE-DIMENSIONAL EQUATIONS IN GAS DYNAMICS
V. E. Raspopov, V. P. Shapeev, and N. N. Yanenko Apr. 1972 10 p refs Transl. into ENGLISH from Chislennye Metody Mekh. Sploshnoi Sredy (USSR), v. 2, no. 5, 1971 p 3-11 Prepared for Calif. Univ., Livermore, Lawrence Livermore Lab. Sponsored by AEC
(UCRL-Trans-10606) Avail: NTIS

Exact solutions are considered for one-dimensional gas dynamic equations by using the method of differential coupling. It is shown that there exist solutions containing only one arbitrary function and characterized by a differential coupling of a special kind. Examples are given of the integrals of the one-dimensional gas dynamic equations and of the solution of certain boundary problems. It is also shown that it is possible to construct more general solutions by using the same differential coupling. The exact solutions given can be used as tests for approximate methods of calculating one-dimensional nonisentropic gas flows. Author

N72-33278# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
STUDY, BY SIMPLE AND DOUBLE EXTRACTION OF PURE AND SEEDED SUPERSONIC JETS, OF THE EFFECTS PRESENT IN THE FORMATION OF A HIGH INTENSITY MOLECULAR BEAM OF ENERGY IN THE RANGE 0 TO 25 eV Ph.D. Thesis
Roger Campargue Jan. 1972 246 p refs In FRENCH
(CEA-R-4213) Avail: AEC Depository Libraries

The shock-wave system of a free jet, produced in a region where the pressure P sub 1 is in the range of 0.01 up to 1 torr, is partly invaded by background molecules, these latter being pumped and carried by the supersonic flow. When a gas mixture is introduced into the nozzle chamber and outside the shock barrel, this aspiration acts very selectively on the light molecules and a mixture enriched in lighter species is attainable by skimming the free jet. This new aerodynamic separation effect, which is applicable to isotopic mixtures, is very effective in comparison with the efficiency of an elementary gas diffusion membrane. The invasion of the free jet by background molecules is reduced either by decreasing P sub 1 the pressure in the expansion chamber, or by increasing the nozzle stagnation pressure P sub 0 even when, in the latter case, P sub 1 is simultaneously increasing. This absolute pressure effect provides a new way of improving the intensity and energy of nozzle beams. Author (NSA)

N72-33279# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
WAKE LABORATORY EXPERIMENT Final Technical Report, 1 Sep. 1971 - 1 Jul. 1972
Gordon E. Merritt 1972 48 p refs
(Contract N00014-72-C-0073; ARPA Order 1910; NR Proj. 062-454)
(AD-744714; CAL-SC-5047-A-2) Avail: NTIS CSCL 20/4

The objective of the research is to obtain data that can be used to predict the concentration of a passive tracer released into the wake of a submarine traveling through a stratified ocean. To develop this prediction capability, information is required on the wake shape and size. Two unique curves are obtained for estimating the horizontal width and vertical height of a wake in a stratified flow. Equations were developed for predicting submarine wake dimensions as a function of submarine velocity, initial wake size, ambient stratification, and time after submarine passage. The very flat and wide wakes observed due to stratification lead to the estimate that the concentration of a passive tracer introduced into a submarine wake would remain high for long times after submarine passage. Author (GRA)

N72-33280# Rocketdyne, Canoga Park, Calif.
THE EFFECT OF CHARGE TRANSPORT ON LIQUID JETS AND LIQUID DROPS Final Technical Report, 1 Jun. 1967 - 31 May 1972
A. L. Huebner 30 Jun. 1972 12 p refs
(Contract N00014-67-C-0474)
(AD-744645; R-9026) Avail: NTIS CSCL 20/4

A technical summary of all work accomplished under the subject contract is presented. Topics included in this summary are: the empirical examination of electrified-jet instabilities and breakup employing high-speed photographic techniques; development of a generalized theory of electrified-jet instabilities using Lagragian techniques; drop-size reduction achieved with electrified jets; examination of charge accumulation in complex, high-velocity flow systems; a broad study of charged-drop instabilities, multiple disintegrations, heat transfer anomalies, and evaporative behavior; and the applicability of the high collection efficiency of charged drops to fog dispersal. Indices of (1) technical reports issued during the course of the contract and (2) all publications resulting from the contract are included. Author (GRA)

N72-33281# Purdue Univ., Lafayette, Ind. Jet Propulsion Center.
A COMPUTER PROGRAM FOR THREE DIMENSIONAL SUPERSONIC FLOW WITH ARBITRARILY DEFINED BOUNDARIES Final Report, 1 May 1971 - 1 Jul. 1972
Brian A. McIntyre and H. Doyle Thompson Jun. 1972 186 p refs
(Contract F33615-71-C-1499; AF Proj. 3012)
(AD-744865; AFAPL-TR-72-51) Avail: NTIS CSCL 20/4

A production type computer program has been developed, for the CDC-6500 computer, which is capable of solving supersonic flow problems through arbitrarily shaped three-dimensional geometries. Provisions have been made for the inclusion of an arbitrarily shaped three-dimensional centerbody in the flow. The geometry of the contours may be specified by tabular data or by expressing parameters in an analytic equation. A second-order numerical method of characteristics is used to solve the equations of motion for three-dimensional, steady supersonic flow. Author (GRA)

N72-33282# Naval Ordnance Lab., White Oak, Md.
EXPERIMENTAL INVESTIGATIONS OF A FIN PROTUBERANCE PARTIALLY IMMERSED IN A TURBULENT BOUNDARY LAYER AT MACH 5
Allen E. Winkelman 21 Jan. 1972 120 p refs
(AD-743903; NOLTR-72-33) Avail: NTIS CSCL 19/2

Various flow visualization results at a nominal Mach number of 5 are presented for cylindrically blunted, unswept and 60-degree swept fins with and without small clearance gaps, partially immersed in a turbulent boundary layer of about 2.6 inches thickness. In addition, pressure and heat transfer measurements were obtained on the flat plate upon which the fin was mounted. Oil smear, azobenzene and schlieren flow visualization tests were made. Author (GRA)

N72-33283# Massachusetts Inst. of Tech., Cambridge. Aerophysics Lab.
OPTIMUM RADIATIVE TRANSFER GEOMETRIES IN HYPERSONIC FLOW
Howard J. Gibeling Jun. 1972 260 p refs
(Contract F44620-71-C-0009; AF Proj. 9783)
(AD-744858; TR-178; AFOSR-72-1029TR) Avail: NTIS CSCL 16/3

The methods of optimal control theory have been applied to achieve minimization of radiative energy transfer to a two-dimensional body of finite length. Molecular transport

properties and real gas effects have been excluded, and local thermodynamic equilibrium as well as a gray gas was assumed. The radiation field was specified by the differential approximation. The main emphasis was on the effect of changes in body geometry on the radiative energy transfer to the surface. Only attached shock waves were considered. The coupled flow and radiation fields were determined based upon a one-strip integral method. Optimal solutions have been obtained for a sequence of nose angles. Author (GRA)

N72-33284# Utah State Univ., Logan.
STUDIES TO DEVELOP AND INVESTIGATE AN INVERSE FORMULATION FOR NUMERICALLY SOLVING THREE-DIMENSIONAL FREE SURFACE POTENTIAL FLUID FLOWS
Roland W. Jeppson Mar. 1972 43 p refs
(Contract N00014-67-A-0220-0003; SR Proj. 009-01-01)
(AD-744701; PRWG-96-1) Avail: NTIS CSCL 20/4

An inverse formulation is developed for solving three-dimensional potential fluid flows which considers the magnitudes of the cartesian coordinates x, y, and z as the dependent variables in the space defined by (i.e. the independent variables) the potential function and two mutually orthogonal stream surface functions whose intersection defines the physical space streamlines. This formulation reverses the usual role of the variables. In this inverse space irregular boundaries, with unknown position in the physical space, such as free surfaces become plane boundaries, and the space of most potential flow problems is a parallelepiped. The basic partial differential equations resulting from this formulation are nonlinear and three in number. Finite difference methods are developed for solving the space boundary value problems simultaneously, which are associated with these three equations. Author (GRA)

N72-33285# California Univ., Los Angeles. Dept. of Mathematics.
NUMERICAL SOLUTION OF THE KROOK EQUATION FOR FLOW PAST A CYLINDER
Gerard Richter Jul. 1972 46 p refs
(Contract N00014-69-A-0200-4022; NR Proj. 044-144)
(AD-744660) Avail: NTIS CSCL 20/4

The Krook kinetic equation is used as the governing equation in an investigation of a class of exterior flow problems involving flow past an elliptic cylinder. A numerical method for solving the integral equation form of the Krook equation for this class of problems is described, and several sets of solutions are presented. Author (GRA)

N72-33286# Ohio State Univ. Research Foundation, Columbus.
INVESTIGATION OF BOUNDARY LAYERS AND TRIP FLOWS OF HELICOPTER ROTOR BLADES Final Report, 15 Apr. 1969 - 15 Jun. 1971
Henry R. Velkoff, Dwight A. Blaser, and John D. Hoffman May 1972 275 p refs
(Contract DAAJ02-69-C-0068)
(AD-745213; USAAMRDL-TR-71-73) Avail: NTIS CSCL 20/4

An experimental and analytical study was conducted on the nature of rotor blade boundary layers and flow over rotor blade tips. The experimental study of boundary layers was conducted using a model rotor and included both hovering and forward flight conditions. Flow visualization using an ammonia trace technique and not-wire anemometry were used to determine the boundary layer flow. Both chordwise and spanwise velocity distributions were obtained through the boundary layer. Velocity profile data were obtained at selected chordwise and spanwise locations. The profiles obtained appeared to be consistent with boundary layer behavior. In hovering, the boundary layer flow in the vicinity of a separation bubble was mapped out. The analytical phase of the study was based upon a three-dimensional application of the momentum-integral techniques of handling boundary layer analysis. Author (GRA)

N72-33287# Naval Postgraduate School, Monterey, Calif.
A DISCRETE POTENTIAL ELEMENT APPROACH TO NONSTEADY SUBSONIC LIFTING SURFACE THEORY Ph.D. Thesis
Richard Louis Breckon Jun. 1972 190 p refs
(AD-745144) Avail: NTIS CSCL 20/4

A discrete potential element approach to subsonic numerical lifting surface theory has been developed and shown to be practical in predicting the nonsteady loading on harmonically oscillating, medium to low aspect ratio wings. A unique method of including the wake effect in the wing kernel function matrix prior to solution of the singular integral downwash equation was devised. Termination of the effective wake a finite distance downstream of the wing was also investigated. The discrete element method has been extended to the case of an oscillating wing, to investigate nonplanar interference effects. Author (GRA)

N72-33288# California Univ., Los Angeles.
ON STATIONARY MODES IN INVISCID ROTATING FLUIDS
J. V. Ralston 30 Jun. 1972 26 p refs
(Contract N00014-69-A-0200-4022; NR Proj. 044-144)
(AD-745012) Avail: NTIS CSCL 20/4

The paper studies the spectrum of the generator of the group of motions of an inviscid fluid in a slowly rotating container. It is shown that for all containers the spectrum is the set (ix/x belongs to (-2,2)). Analogous results are obtained for axi-symmetric motions of a large rotating ring of fluid (the Poincare problem) and a family of examples exhibiting various mixtures of continuous and point spectrum is given for this case. Author (GRA)

N72-33289# Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics.
INSTANTANEOUS PRESSURE DISTRIBUTION AROUND A SPHERE IN UNSTEADY FLOW
Leslie S. G. Kovasznay, Itiro Tani, Masahiko Kawamura, and Hajime Fujita Dec. 1971 35 p refs
(Contract N00014-67-A-0163-002)
(AD-745026) Avail: NTIS CSCL 20/4

In order to study effects of velocity and acceleration of a flow to the pressure on an obstacle, a small sphere with a pressure hole was placed in a periodically pulsating jet. Both the instantaneous pressure on the sphere and the instantaneous velocity of the flow field when the sphere was absent were measured. By using periodic sampling and averaging techniques, only periodic or deterministic component of the signal was recovered and any random component caused by turbulence suppressed. The measured surface pressure was expressed in terms of this measured velocity and acceleration of the flow. A simple inviscid theory was developed and the experimental results were compared with it. Author (GRA)

N72-33290# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
ENVIRONMENTAL EFFECTS ON MECHANICAL FAILURE INVOLVING PARTICULARLY MULTIPHASE FLOWS
Frederick G. Hammitt Apr. 1972 9 p refs Presented at Mech. Failures Prevention Group Meetings on Environ. Effects on Mech. Failures, Mechanisms and Detection, Denver, 25-27 Apr. 1972; Sponsored by ONR and NBS
(Grant NSF GK-730)
(PB-209276; UMICH-00371-16-T) Avail: NTIS HC $3.00 CSCL 20D

The subject concerns in most general terms two major types of phenomena, i.e., those involving primarily liquid flows, and primarily gaseous or vaporous flows. In each such category there are several technologically important damaging situations which are discussed. Author (GRA)

N72-33291# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Mechanics.
EFFECT OF FREE-STREAM VORTICITY ON BOUNDARY-

LAYER STABILITY Final Report
M. J. Werle, D. T. Mook, and H. Tang Feb. 1972 38 p refs
(Grant NSF GK-5224)
(PB-209707; VPI-E-72-2) Avail: NTIS HC $3.00 CSCL 20D

The Orr-Sommerfeld equation was used to ascertain the influence of free-stream vorticity on the stability of incompressible boundary-layer flow. The primary flow velocity profiles were obtained using second-order boundary-layer theory. Self-similar flows with positive and negative pressure gradients and free-stream vorticities were considered. The results show how positive vorticity at the edge of the boundary layer is stabilizing and how the free-stream vorticity influences the critical Reynolds numbers more when the pressure gradient is small, and the range of unstable wave lengths more when the pressure gradient is large. The results indicate that small amounts of vorticity in the free stream might have a large influence on transition. GRA

N72-33292# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
HYDRODYNAMIC PHENOMENA DURING HIGH SPEED COLLISION BETWEEN LIQUID DROPLET AND RIGID PLANE
Yen C. Huang, F. G. Hammitt, and W. J. Yang May 1972 56 p refs Submitted for publication
(Grant NSF GK-730)
(PB-210626; UMICH-03371-12-T) Avail: NTIS HC $3.00 CSCL 20D

The dynamics of high-speed impact between a compressible water droplet and a rigid solid surface is investigated analytically. The purpose of the study is to examine the mechanism leading to the erosion of a material due to liquid impingement. A compressible-cell-and-marker numerical method is developed to solve the differential equations governing the unsteady, two-dimensional liquid-solid impact phenomena. The method is designed to solve this steady portion up until the flow reasonably approaches the steady state solution. The validity of the method is confirmed by comparing its numerical results with the idealized exact solution for the classical one-dimensional liquid impact problem. The accuracy of the numerical results is found to be very good in that only slight numerical oscillations occur.
Author (GRA)

N72-33293# Purdue Univ., Lafayette, Ind. Jet Propulsion Lab.
POINT MEASUREMENT OF DENSITY BY LASER RAMAN SCATTERING
Donald A. Leonard (Avco Res. Labs., Everett, Mass.) Jun. 1972 44 p refs
(Contract N00014-67-A-0226-0005; NR Proj. 098-038; Proj. SQUID)
(AD-744924; SQUID-TR-AVCO-1-PU) Avail: NTIS CSCL 20/4

The report describes an experimental feasibility investigation of the use of Raman scattering as a means of making point measurements of density in three-dimensional flows, such as, in turbocompressor machinery. A 3371 A ultraviolet pulsed nitrogen laser was used as the laser source. The major problem area considered was the ability to make measurements close to the walls and in confined internal geometries. The density in a flow past a heated cylinder was measured by both the Raman technique and a standard interferometer and the two method were shown to agree. Author (GRA)

N72-33966 National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
FLOW DISTORTION AND PERFORMANCE MEASUREMENTS ON A 12 INCH FAN-IN-WING MODEL FOR A RANGE OF FORWARD SPEEDS AND ANAGLE OF ATTACK SETTINGS
U. W. Schaub and R. W. Bassett *In its* Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 15-32 refs (For availability see N72-33964 24-34)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N72-33294 National Lending Library for Science and Technology, Boston Spa (England).
PHYSICS OF THE INTERACTION OF ATMOSPHERE AND OCEAN
S. A. Kitajgorodskij [1972] 233 p refs Transl. into ENGLISH from Russian book p 10-268
(NLL-M-22035-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 23 NLL photocopy coupons

Theoretical and experimental studies on ocean-atmosphere interactions comprise physics of the atmospheric layer near the water, wind wave problems of interaction effects and statistics of hydrometeorological conditions, and vertical turbulent mixing in the surface layer of the ocean. G.G.

N72-33295 National Lending Library for Science and Technology, Boston Spa (England).
COMPUTATION AND REGULATION OF HEAT REGIMES IN OPEN AND PROTECTED GROUND
D. A. Kurtener and A. F. Chudnovskiy 11 Sep. 1970 112 p refs Transl. into ENGLISH from "Rachet i Regulirovaniye Teplovogo Rezhima v Otkrytom i Zashchishchennom Grunte" Leningrad, Gidrometeoizdat., 1969 p 31-34, 43-156, equation on p 182 and p 236-244 No diagrams, etc.; to be used in conjuction with original paper
(NLL-M-20159-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 11 NLL photocopy coupons

The temperature field in the soil is analyzed and estimated on the basis of the analytical theory of heat conduction, and the thermal characteristics of the soil are described. A method is outlined for calculating soil temperature based on heat balance and allowing for variations of meteorological parameters. Convection, radiation, and evaporation, and errors in the formulation of boundary conditions are considered. Ways of regulating soil temperature by mulching, loosening, rolling, and stubbling are described, and methods for calculating the soil temperature under these conditions are outlined. The thermal regime of soil on sloping ground and the soil temperature is calculated. N.E.N.

N72-33296 National Lending Library for Science and Technology, Boston Spa (England).
ON CURRENT AND WATER-TEMPERATURE VARIABILITY
V. I. Verbolov Jul. 1972 18 p refs Transl. into ENGLISH from Tr. Limnol. Inst., Akad. Nauk SSSR, Sib., Otd. (Moscow), v. 12, no. 32, 1971 p 15-28
(NLL-RTS-7432) Avail: Natl. Lending Library, Boston Spa, Engl.: £1.80; 6 NLL photocopy coupons

Detailed data are presented on the variability of the currents and temperature in the Selenga area of Lake Baikal (7 km from the shore of the Selenga delta, down to a depth of 50 m). Two conclusions were drawn: (1) At the point investigated, the currents are distinguished by their degree of variability. The mean duration of flow in the same direction is about 42 hr at a depth of 13 m (maximum 5 days), about 45 hr at 25 m (maximum 7 days), and about 45 hr at 47 m (maximum 5 days). Meteorological factors play the main role in forming the current regime. The speed of the currents changes relatively quickly and can be fairly high for long periods. The greatest speeds are fixed-on 13 m depth. (2) The high degree of mobility of the waters is accompanied by temperature instability in time. During July through September, the variations of daily temperature at various depths reached approximately 20% of its mean value.
Author

N72-33297 National Lending Library for Science and Technology, Boston Spa (England).
THE POLAR ICE AND CLIMATE
M. I. Budyko 30 Nov. 1970 41 p refs Transl. into ENGLISH from Tr. Naunchn.-Issled. Inst. Gidrometrol. Priborostr. (Leningrad), 1969 p 2-36 No diagrams, etc.; to be used in conjunction with original paper
(NLL-M-20106-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 4 NLL photocopy coupons

The mutual relationship between the polar ice regime and the climatic conditions in the Arctic is discussed in detail, along with the interrelationship between man and his industries on the one hand and the ice regime on the other. A brief history of the ice cap during the Quaternary period is reviewed, and details of the heat balance in the Arctic, the climatological effects on the ice sheet, and the ice cover effects on the climate are given. The stability of the ice cap and the Arctic with no ice are considered. The influence of man's production of heat, and development of industry and power engineering on the heat balance of the Arctic is also discussed. N.E.N.

N72-33298*# Itek Corp., Lexington, Mass. Optical Systems Div.
AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-A IMAGES Progress Report, 16 Jul. - 15 Sep. 1972
Nicholas Gramenopoulos, Principle Investigator 22 Sep. 1972 2 p
(Contract NAS5-21766)
(E72-10063; NASA-CR-128079) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N72-33299*# Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.
METEOROLOGICAL UTILITY OF HIGH RESOLUTION MULTISPECTRAL DATA Progress Report, period ending 30 Aug. 1972
John M. Danko, Principal Investigator 30 Aug. 1972 2 p
(Contract NAS5-21741)
(E72-10065; NASA-CR-128081) Avail: NTIS HC $3.00 CSCL 04B

There are no author-identified significant results in this report.

N72-33300*# Pennsylvania State Univ., University Park. Space Science and Engineering Lab.
INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF ERTS DATA WITHIN THE SUSQUEHANNA RIVER BASIN: RESOURCE INVENTORY, LAND USE AND POLLUTION Progress Report, 1 Jul. - 1 Aug. 1972
George J. McMurtry, Principle Investigator 7 Sep. 1972 1 p
(Contract NAS5-23133)
(E72-10066; NASA-CR-128082) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N72-33301*# Geological Survey, Washington, D.C.
CENSUS CITIES EXPERIMENT IN URBAN CHANGE DETECTION Progress Report, 1 Jul. - 31 Aug. 1972
James R. Wray, Principal Investigator 1 Sep. 1972 4 p
Sponsored by NASA
(E72-10117; NASA-CR-128166) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N72-33302*# North American Rockwell Corp., Thousand Oaks, Calif. Science Center.
IDENTIFICATION AND INTERPRETATION OF TECTONIC FEATURES FROM ERTS-1 IMAGERY Progress Report, 31 Jul. - 30 Sep. 1972
Monem Abdel-Gawad, Principal Investigator Oct. 1972 6 p
(Contract NAS5-21767)
(E72-10143; NASA-CR-127328) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. An important fault zone, which is strongly suspected of being seismically active, was identified on RBV images, ERTS E-1013-17305 (101, 201, and 301), in northeastern Utah. This fault zone is not shown on the Geological Map of the United States nor on the Tectonic Map of North America. When the epicenters of historic earthquakes and their magnitudes were plotted on an overlay corresponding to the scene, a major earthquake cluster up to magnitude 4.9 was found through which the fault zone passes. This suspected active fault zone runs in a northwest-southeast direction cutting across the Patmos Mountains and the southwestern side of the East Tavaputs Plateau from near the junction of the Colorado River with the Dolores River to and beyond the town of Dragerton, Utah. The fault zone which will subsequently be referred to as the Dragerton fault zone appears to be an element of a major tectonic lineament which includes the Moab fault, Salt Valley, Spanish and Lisbon Valleys. Because of the limited imagery coverage received so far, the extent of this lineament or its tectonic significance cannot be ascertained. It is suspected, however, that it constitutes a major crustal break in the Colorado Plateau.

N72-33303*# Ohio Dept. of Economic and Community Development, Columbus.
RELEVANCE OF ERTS TO THE STATE OF OHIO Progress Report, Aug. - Sep. 1972
David C. Sweet, Principal Investigator Sep. 1972 6 p
Prepared for Battelle Columbus Labs., Ohio.
(Contracts NAS5-21782; BCL-72-17/G-1793)
(E72-10144; NASA-CR-127329) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N72-33304*# Earth Satellite Corp., Berkeley, Calif.
A SCHEME FOR THE UNIFORM MAPPING AND MONITORING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES USING ERTS-1 IMAGERY Progress Report, 15 Jun. - 31 Aug. 1972
Charles E. Poulton, Principal Investigator and Robin I. Welch 20 Sep. 1972 6 p Sponsored by NASA
(E72-10145; NASA-CR-127330; PR-1) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N72-33305*# California Univ., Riverside. Dept. of Plant Sciences.
EVALUATION OF REMOTE SENSING IN CONTROL OF PINK BOLLWORM IN COTTON Progress Report, Aug. - Sep. 1972
Lowell N. Lewis, Principal Investigator and Virginia B. Coleman Sep. 1972 7 p refs Sponsored by NASA
(E72-10147; NASA-CR-127332) Avail: NTIS HC $3.00 CSCL 06F

There are no author-identified significant results in this report.

N72-33306*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
UTILIZATION OF ERTS-1 DATA IN THE HOUSTON AREA Progress Report, Jul. - Aug. 1972
R. Bryan Erb, Principal Investigator 21 Sep. 1972 4 p
(E72-10148; NASA-TM-X-68627) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N72-33307*# Purdue Univ., Lafayette, Ind.
A STUDY OF THE UTILIZATION OF ERTS-A DATA FROM THE WABASH RIVER BASIN Bimonthly Progress Report
David A. Landgrebe, Principal Investigator 31 Aug. 1972 4 p
(Contract NAS5-21773)
(E72-10149; NASA-CR-128285) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. Preliminary results from the Texoma frame of data indicate many potentials in the analysis and interpretation of ERTS-1 data. It is believed that one of the more significant aspects of this analysis sequence has been the investigation of a technique to relate ERTS analysis and surface observation analysis. At present a sequence involving (1) preliminary analysis based solely upon the spectral characteristics of the data, followed by (2) a surface observation mission to obtain visual information and oblique color photography of particular points of interest in the test site area, appears to provide an extremely efficient technique for obtaining particularly meaningful surface observation data. Following such a procedure allows concentration on particular points of interest in the entire ERTS frame and thereby making the surface observation data obtained to be particularly significant and meaningful. The analysis of the Texoma frame has also been significant from the standpoint of demonstrating a fast turn around analysis capability. Additionally, the analysis has shown the potential accuracy and degree of complexity of features that can be identified and mapped using ERTS-1 data.

N72-33308*# Centre for Overseas Pest Research, London (England).
DETECTION OF POTENTIAL LOCUST BREEDING SITES Progress Report, 23 Jul. - 22 Oct. 1972
D. E. Pedgley, Principal Investigator 23 Oct. 1972 1 p Sponsored by NASA
(E72-10150; NASA-CR-128286) Avail: NTIS HC $3.00 CSCL 06C

There are no author-identified significant results in this report.

N72-33309*# International Business Machines Corp., Gaithersburg, Md.
ALL DIGITAL PROCESSING OF ERTS IMAGES Progress Report, period ending 30 Sep. 1972
Ralph Bernstein, Principal Investigator 23 Oct. 1972 3 p
(Contract NAS5-21716)
(E72-10151; NASA-CR-128287) Avail: NTIS HC $3.00 CSCL 09B

There are no author-identified significant results in this report.

N72-33310*# Earth Satellite Corp., Washington, D.C.
INVESTIGATION TO IMPROVE MENHADEN FISHERY AND PREDICTION Progress Report, 1 Aug. - 31 Oct. 1972
Paul M. Maughan, Principal Investigator 20 Oct. 1972 4 p
(Contract NAS5-21743)
(E72-10152; NASA-CR-128288) Avail: NTIS HC $3.00 CSCL 08A

There are no author-identified significant results in this report.

N72-33311*# Environmental Research Inst. of Michigan, Ann Arbor.
COMPUTER PROCESSING OF ERTS-1 MSS DATA FROM THE SAN FRANCISCO FRAME (1003 - 18175)
F. J. Thomson, Principal Investigator, M. Gordon, J. Morgenstern, and F. Sadowski 25 Jul. 1972 3 p Sponsored by NASA Original contains color illustrations. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(E72-10153; NASA-CR-128289; Rept-011229-8-L) Avail: NTIS HC $3.00 CSCL 09B

There are no author-identified significant results in this report.

N72-33312*# Earth Satellite Corp., Washington, D.C.
INVESTIGATION OF APPLICATION OF ERTS-1 DATA TO INTEGRATED STATE PLANNING IN MARYLAND Interim Report, 22 Jun. - 30 Sep. 1972
Kurt Hecht, Principal Investigator 30 Sep. 1972 18 p
Prepared for Md. Dept. of State Planning
(Contract NAS5-21779)
(E72-10154; NASA-CR-128290) Avail: NTIS HC $3.00 CSCL 05A

There are no author-identified significant results in this report.

N72-33313*# National Center for Earthquake Research, Menlo Park, Calif.
INVESTIGATION OF PROTOTYPE VOLCANO SURVEILLANCE NETWORK Progress Report, 1 Jul. - 31 Aug. 1972
Jerry P. Eaton, Principal Investigator and Peter L. Ward 1 Sep. 1972 2 p Sponsored by NASA
(E72-10155; NASA-CR-128291) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N72-33314*# National Oceanic and Atmospheric Administration, Miami, Fla.
OCEANOGRAPHIC OBSERVATION OF NEW YORK BIGHT FROM ERTS-1
George A. Maul, Principal Investigator and Robert L. Charnell 13 Oct. 1972 11 p refs Original contains illustrations. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(NASA Order S-70246-AG)
(E72-10156; NASA-CR-128292) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant events. The Earth Resources Technology Satellite made a transit over New York Bight on 16 August, 1972. Imagery from this transit shows several oceanographic features that demonstrate the usefulness of remote sensing for large area, synoptic observation of changes in water quality in the coastal zone. Both the extent and turbulent character of the Hudson River plume are discernible in the image. Residue from a dump of waste acid is visible over a five mile area in the apex of the Bight. Little dispersion of this residue has occurred which suggests that this feature will be a persistent signature in images from future satellite transits.

N72-33315*# Texas Technological Univ., Lubbock. Dept. of Geosciences.
DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS Progress Report, Apr. - Sep. 1972
C. C. Reeves, Jr., Principal Investigator Oct. 1972 21 p Original contains illustrations. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21720)
(E72-10158; NASA-CR-128309) Avail: NTIS $3.25 CSCL 08H

The author has identified the following significant results. Three small playa lake basins on the southern High Plains, Texas, have been examined by geologists, pedologists, hydrologists, and botanists to establish ground truth for correlation with ERTS-1 imagery. Although the sites are recognizable, details of the three playa basins are too small, at present resolution, to be accurately determined by the available MSS imagery. However, a fourth study site, consisting of a dual playa complex approximately 5 miles long in a basin of 9 square miles,

does resolve available imagery allowing accurate measurement of water fluctuations and water depth. Of the available MSS imagery, Band 5 is the most usable. Definition of Band 4 is less due to reduced tonal contrast. The greatest tonal contrast appears on Band 6 and Band 7 between dry land and water areas. Band 6 is particularly good for defining large water areas, Band 7 being best for small lake basins, and Band 5 for growing fields.

N72-33316*# Arizona Univ., Tucson.
A STUDY TO EXPLORE THE USE OF ORBITAL REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Progress Report
William G. McGinnies, Principal Investigator 10 Oct. 1972 1 p Sponsored by NASA
(E72-10159; NASA-CR-128310) Avail: NTIS HC $3.00 CSCL 06C

There are no author-identified significant results in this support.

N72-33317*# Old Dominion Univ. Research Foundation, Norfolk, Va.
TASK 1: CORRELATION OF SATELLITE AND GROUND DATA IN AIR POLLUTION STUDIES. TASK 2: INVESTIGATION TO RELATE THE CHLOROPHYLL AND SUSPENDED SEDIMENT CONTENT IN THE WATERS OF THE LOWER CHESAPEAKE BAY TO ERTS-1 IMAGERY. TASK 3: THE USE OF ERTS-1 TO MORE FULLY UTILIZE AND APPLY MARINE STATION DATA TO THE STUDY OF PRODUCTIVITY ALONG THE EASTERN SHELF EXPANDED WATERS OF THE UNITED STATES Bimonthly Progress Report, 1 Aug. - 30 Sep. 1972
G. E. Copeland, Principal Investigator, A. R. Bandy, P. Fleischer, John C. Ludwick, Principal Investigator, W. J. Hanna, T. A. Gosink, D. W. Bowker, and Howard G. Marshall, Principal Investigator 30 Sep. 1972 12 p
(Contract NAS5-21816)
(E72-10160; NASA-CR-128311) Avail: NTIS HC $3.00 CSCL 08A

The author has identified the following significant results. Analysis of U-2 imagery of CARETS site indicates smoke plumes can be easily detected. First look at selected ERTS-1 color composites demonstrates plumes from forest fires can be detected.

N72-33318*# TRW Systems Group, Redondo Beach, Calif.
ERTS IMAGE DATA COMPRESSION TECHNIQUE EVALUATION Monthly Progress Report, period ending 1 Oct. 1972
Donald J. Spencer, Principal Investigator 5 Oct. 1972 1 p Sponsored by NASA
(E72-10161; NASA-CR-128312; TRW-7132.1-04) Avail: NTIS HC $3.00 CSCL 09B

There are no author-identified significant results in this report.

N72-33319*# Michigan State Univ., East Lansing.
USE OF DATA FOR A MULTIDISCIPLINARY ANALYSIS OF MICHIGAN RESOURCES. TASK 1: ANALYSIS OF FORESTS AND RELATED NATURAL RESOURCES. TASK 2: ANALYSIS OF AGRICULTURAL CROPS. TASK 3: EVALUATION OF SOILS, SOIL CONDITIONS, AND LANDFORMS Progress Report
Wayne L. Myers, Principal Invesgitator, A. H. Ellingboe, Principal Investigator, and E. P. Whiteside, Principal Investigator 1 Oct. 1972 4 p
(Contract NAS5-21834)
(E72-10162; NASA-CR-128313; PR-1) Avail: NTIS HC $3.00 CSCL 02F

There are no author-identified significant results in this report.

N72-33320*# Mitre Corp., McLean, Va.
ENVIRONMENTAL INDICES FROM ERTS-1 Bimonthly Progress Report
Richard S. Greeley, Principal Investigator 31 Oct. 1972 6 p
(Contract NAS5-21482)
(E72-10163; NASA-CR-128314) Avail: NTIS HC $3.00 CSCL 08E

There are no author-identified significant results in this report.

N72-33321*# Vermont Univ., Burlington.
ENVIRONMENTAL STUDY OF ERTS-1 IMAGERY, LAKE CHAMPLAIN BASIN AND VERMONT Bimonthly Progress Report, Aug. - Sep. 1972
A. O. Lind, Principal Investigator 1 Oct. 1972 3 p
(Contract NAS5-21753)
(E72-10164; NASA-CR-128325) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N72-33322*# Cornell Univ., Ithaca, N.Y.
PHENOLOGY SATELLITE EXPERIMENT
Bernard E. Dethier, Principal Investigator 4 Oct. 1972 2 p
(Contract NAS5-21781)
(E72-10165; NASA-CR-128349) Avail: NTIS HC $3.00 CSCL 14E

There are no author-identified significant results in this report.

N72-33323*# Corps of Engineers, Waltham, Mass.
THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Progress Report, 14 Aug. - 14 Oct. 1972
Saul Cooper, Principal Investigator and Paul Bock 26 Oct. 1972 5 p Sponsored by NASA
(E72-10166; NASA-CR-128350) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N72-33324# Oregon State Univ., Corvallis.
AIRPHOTO ANALYSIS OF OCEAN OUTFALL DISPERSION
Fred J. Burgess and Wesley P. James Jun. 1971 298 p refs Sponsored by the Environmental Protection Agency. Its Water Pollution Control Res. Series no. 16070 ENS
Avail: SOD $2.25

Aerial photography was taken of the ocean outfall waste plume at Newport, Oregon, during the summers of 1968, 1969, and the period extending from September 1970 through May 1971. Conventional boat sampling of the waste field was conducted concurrently with the photography during the 1968 and 1969 field seasons. The photographic technique is more comprehensive and permits waste concentrations to be measured throughout the plume in one instant. Procedures were developed to evaluate proposed ocean outfall sites by using dye drops from an airplane. Diffusion coefficients and water current velocities were determined from aerial photography. When the hydrography of the receiving water allowed the formation of a surface plume, the water current velocity was found to be the dominant factor in the resulting plume pattern. The equation for a line source in a uniform stream provided the x and y velocity components for a two-dimensional diffusion model with the losses to the lower layers being considered by including a decay coefficient. Author

N72-33325*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
DATA ON OCEAN CONDITIONS FOR SPACE SHUTTLE BOOSTER RECOVERY CRITERIA
Preston E. Beck 15 Jun. 1972 108 p
(NASA-TM-X-68631; KSC-TR-1180) Avail: NTIS HC $7.50

CSCL 08C

Empirical data are presented on the probable sea states that will be encountered by the booster recovery force. Such data are required to establish the criteria for the recovery equipment and procedures. Author

N72-33326# Centre for Overseas Pest Research, London (England).

USE OF SATELLITES AND RADAR IN LOCUST CONTROL

D. E. Pedgley 15 Sep. 1972 6 p refs Presented at Symp. on Remote Sensing, Bristol, Engl., 2 Oct. 1972

Avail: NTIS HC $3.00

After outlining the population dynamics of the desert locust, the current use of meteorological satellites in helping to locate cloud systems that can give rains sufficient for breeding is discussed. An experiment is described in which the first Earth Resources Technology Satellite is to be used to test the feasibility of directly locating potential breeding sites, i.e. ground that has been wetted by such rains, and where vegetation is becoming greener. Studies are mentioned in which radar has been used to examine the flight of solitary locusts and to locate wind systems near which flying populations are likely to be concentrated. Some possible lines for future development are given. Author

N72-33327*# Pittsburgh Univ., Pa. Space Research Coordination Center.

MEASUREMENTS OF O(1 D) QUENCHING RATES IN THE F-REGION

Dwight P. Sipler and Manfred A. Biondi Apr. 1972 33 p refs

(Grant NGR-39-011-002)

(NASA-CR-128335; SRCC-170; APP-29) Avail: NTIS HC $3.75 CSCL 04A

In-situ determinations of the quenching of O(1 D) atoms by N2 and O2 molecules were made from observations of 6300 A nightglow intensity enhancements produced by the Platteville 1.6 MW transmitter. The heating of F-region electrons near the point of reflection of the RF wave leads to electron impact excitation of oxygen atoms to the O(1 D) state. It is shown that the resulting region of enhance 6300 A emission is localized to the region of electron energy absorption for heating at the lower altitudes. At 225 km the measured time constants for intensity buildup following transmitter turn-on and for intensity decay following turn-off are identical and equal to (13 plus or minus 1) sec. Time constants varying from 30 to 80 sec are found for the altitude range 260 to 300 km. The inferred quenching coefficient for the whole altitude range, 225 to 300 km, is 4.4 + 2 or - 1 x 10 to the minus 11th power cu cm/sec at 950 K, in good agreement with laboratory data. The quenching frequency obtained at 225 km, when referred to the altitude 120 km, is equal to (21 plus or minus 2)/sec, in agreement with less direct ionospheric determinations. Author

N72-33328# California Univ., Berkeley. Forestry Remote Sensing Lab.

TESTING THE USEFULNESS OF SIDE LOOKING AIRBORNE RADAR IMAGERY FOR EVALUATING FOREST VEGETATION RESOURCES Final Report

Steven J. Daus and Donald T. Lauer 31 May 1971 79 p refs

A fully illustrated report can be obtained on loan from the Forestry Remote Sensing Lab., Calif. Univ., Berkeley

(Contract CRINC-1775-9)

Avail: NTIS HC $6.00 CSCL 02F

An experiment was conducted to determine the usefulness of like-polarized AN/APQ-97 side looking airborne radar (SLAR) imagery for evaluating wildland vegetation resources in the northern Sierra Nevada Mountains of California. Results indicate that utilization of AN/APQ-97 SLAR imagery as a vegetation inventory tool encounters severe limitations since the combination effect of variable topography and the unidirectional (line-of-sight) characteristics of the SLAR system generally produces an image not characteristic of the vegetation resource, but of the topographic conformation. Useful topographic and geographic information is extractable from the SLAR imagery, and, for relatively flat terrain, tonal and textural variations associated with differences in vegetation cover often are discernible. Author

N72-33329# Joint Publications Research Service, Arlington, Va.

THE ELECTRIC FIELD OF SEA WAVES

G. A. Fonarev 29 Sep. 1972 7 p refs Transl. into ENGLISH from Geomagnitnyye Issled. (Moscow), no. 13, 1971 p 39-42

(JPRS-57140) Avail: NTIS HC $3.00

The interaction of sea waves with the geomagnetic field is discussed. This interaction induces electric currents and fields in the water. Numerical evaluation is obtained of the electric effects of wind waves and of the electric field of the constant component of the progressive wave speed. The electric effect of waves on various marine electrometric systems is considered. Author

N72-33330*# Arizona Univ., Tucson. Office of Arid Lands Studies.

THE USE OF HIGH ALTITUDE REMOTE SENSING IN DETERMINING EXISTING VEGETATION AND MONITORING ECOLOGICAL STRESS

Kennith Foster and Alex Garcia Aug. 1972 33 p

(Grant NGL-03-002-313)

(NASA-CR-128377; OALS-Bull-2) Avail: NTIS HC $3.75 CSCL 08M

High altitude color and multispectral black and white photography was used to survey existing vegetation and soil conditions on the Empire Ranch where large scale development will soon begin. Utilizing stereo pairs of the high altitude color photography, four vegetation classifications were discernable as a function of topography and foliage characteristics. In contrast to the undeveloped Ranch, the same photography was used to detect environmental changes in the Tucson metropolitan area as a result of rapid urbanization. The most prevalent change related to development is the removal of vegetation in high density areas to allow for housing starts. Erosion then occurs where vegetation has been removed. Author

N72-33331*# Arizona Univ., Tucson. Office of Arid Lands Studies.

GENERAL SOIL MAP LOWER PANTANO WASH AREA, PIMA COUNTY, ARIZONA

M. L. Richardson (Dept. of Agr.) Jun. 1972 34 p refs Original contains color illustrations

(Grant NGL-03-002-313)

(NASA-CR-128376; OALS-Bull-1) Avail: NTIS HC $3.75 CSCL 08M

High altitude color photography was used to determine soil type variation over large areas at a contact print scale of 1:125,000. It was found that color variation and land form could be used as a basis for assigning seven soil mapping units to the area as depicted on stereoscopic pairs of the color photography. A unit is assigned by soil scientists on the basis of similarity of soil features in the area to predetermined physical and chemical characteristics of the same soil type. Author

N72-33332# Joint Publications Research Service, Arlington, Va.

OPTICAL PHENOMENA IN THE ATMOSPHERE AS OBSERVED FROM MANNED SPACESHIPS

K. Ya. Kondratyev, ed. 30 Oct. 1972 56 p refs Transl. into ENGLISH of the publ. "Opticheskiye yavleniya v atmosfere po nablyudeniyam s pilotiruyemykh kosmicheskikh korable" USSR, Gidrometeoizdat, 1972 p 4-47

(JPRS-57366) Avail: NTIS HC $5.00

Some generalizations concerning the results of investigations of optical phenomena in the earth's atmosphere as observed by Soviet cosmonauts in space are reported. A detailed description is given of observations leading to the discovery of the horizontal nonuniformity of the day emission of the upper atmosphere. Author

N72-33333# Lockheed Missiles and Space Co., Palo Alto, Calif.
REFRACTION OF NORMAL WAVES AT A WEDGE LYING ON A HALF-SPACE
V. K. Kuznetsov 1972 8 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 3: Fiz-Astron. (Moscow), no. 3, 1972 p 293-300
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The hydroacoustic problem of low frequency sound propagation in the coastal band of the shelf is investigated under variable depth conditions. In conformity with the representations used in hydroacoustics and geophysics, the shelf domain is considered as a wedge. Author

N72-33334*# Geological Survey, Washington, D.C.
CONTRIBUTIONS TO ASTROGEOLOGY: GEOLOGY OF THE LUNAR CRATER VOLCANIC FIELD, NYE COUNTY, NEVADA
David H. Scott and N. J. Trask 1971 25 p refs Sponsored by NASA
(NASA-CR-128715; LC-77-611770; USGS-PP-NASA-599-1) Avail: NTIS; SOD $0.75 CSCL 08G

The Lunar Crater volcanic field in east-central Nevada includes cinder cones, maars, and basalt flows of probably Quaternary age that individually and as a group resemble some features on the moon. Three episodes of volcanism are separated by intervals of relative dormancy and erosion. Changes in morphology of cinder cones, degree of weathering, and superposition of associated basalt flows provide a basis for determining the relative ages of the cones. A method has been devised whereby cone heights, base radii, and angles of slope are used to determine semiquantitatively the age relationships of some cinder cones. Structural studies show that cone and crater chains and their associated lava flows developed along fissures and normal faults produced by tensional stress. The petrography of the basalts and pyroclastics suggests magmatic differentiation at depth which produced interbedded subalkaline basalts, alkali-olivine basalts, and basanitoids. The youngest flows in the field are basanitoids. Author

N72-33335# Sandia Labs., Albuquerque, N.Mex. Space Systems Dept.
OPTICAL AND ELECTROMAGNETIC CHARACTERISTICS OF LIGHTNING DISCHARGES
R. L. Chiburis May 1972 30 p refs Sponsored in part by AEC (ARPA Order 2097)
(SC-DR-720188) Avail: NTIS

Spectral and temporal characteristics of optical and electromagnetic (EM) signals from lightning discharges are surveyed. Estimates of the lightning flashing rate and duration, and the diurnal and annual periodicity of thunderstorms are also given. Emphasis is placed on source effects; any effects relating to propagation are presented only incidentally. The strongest optical and EM signals are radiated by the first and subsequent return strokes of a ground discharge. Intracloud discharges are usually less intense, but can be considerably stronger than average return strokes over particular optical and radio wavelength regions. Optical signals from ground and intracloud discharges differ substantially, and their distinguishing characteristics are discussed. Finally, statistics are presented to identify the predominant characteristics of lightning-discharge EM signals. Author

N72-33336# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
STUDY OF TRITIATED HYDROGEN AND ITS COMPOUNDS IN THE ENVIRONMENT Progress Report, 15 Aug. 1971 - 15 Apr. 1972
H. Goete Oestlund 15 Apr. 1972 14 p
(Contract AT(40-1)-3944)
(UM-RSMAS-72031) Avail: NTIS

In addition to the existing ground-level stations for atmospheric HT and HTO in Miami and Fairbanks, a third station was established at the Mauna Loa Observatory, Island of Hawaii. Routine sampling and analysis of the samples from all three ground stations on a twice-weekly basis have been continued. Data up to the end of 1971 are available. A longitudinal profile from the U.S. to 65 deg S of HT and HTO was collected. A second Big Green Box, aircraft sampler, was built and six vertical profiles on the NCAR Sabreliner were sampled. A sampling system for the RB-57F aircraft is presently under construction. Author (NSA)

N72-33337# Groupe de Recherches de Geodesie Spatiale,
REDUCTION OF FRENCH LASER DATA AS PART OF THE ISAGEX [REDUCTION DES DONNEES LASER FRANCAISES D'ISAGEX]
Gerard Brachet (CNES) and Claude Brossier 1 May 1972 97 p In FRENCH; ENGLISH summary
(GRGS-Bull-4) Avail: NTIS HC $7.00

Ten laser tracking stations have provided a large amount of data during the International Satellite Geodesy Experiment (ISAGEX) in 1971. Three of these were French stations, in Haute Provence (France), San Fernando (Spain) and Dakar (Senegal). The reduction of the 538 passes on which they have collected laser data is described in detail. After recalling the objectives of the laser data reduction, the method is described, with particular emphasis on the first two phases: pass by pass analysis of residuals, and addition of timing and range measurements information. Author (ESRO)

N72-33338# Saab Aircraft Co., Linkoping (Sweden). Missiles and Electronics Div.
MICROWAVE RADIOMETRY AND ITS POTENTIAL APPLICATION TO EARTH RESOURCES SURVEYS. VOLUME 5: THEMATIC BIBLIOGRAPHY
Sune Axelsson, comp. Jun. 1972 56 p refs
(Contract ESTEC-1411/71-EL)
(RL-0-3-R5; ESRO-CR(P)-126) Avail: NTIS HC $5.00

The bibliography is based on reports, articles, and other documents taken from TPA, STAR and IAA during 1962-1970, and consists of standard bibliographic information plus keywords. The following sections are included: applications, land surfaces, water surfaces, material properties, technology and methodology, sensors, and data processing and analysis. For Vol. 1, see N72-22411; for Vol. 3, see N72-21163. Author (ESRO)

N72-33339# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
OBSERVATIONS OF ELECTRON FLUXES AND RELATED VARIATIONS OF IONOSPHERIC PLASMA PARAMETERS IN THE SOUTH POLAR CUSP
K. I. Gringauz, G. L. Gdalevich, M. Z. Khoklov, A. P. Remizov, Y. I. Logachev, V. G. Stolpovsky, B. N. Gorozhankin, V. V. Afonin, and S. M. Sheronova 1972 13 p refs
(D-141) Avail: NTIS HC $3.00

Data obtained from Cosmos 378 during flight over the southern hemisphere dayside polar cusp at noon (local time) are given. The data are essentially measurements of charged particles in the broad energy range (in particular fluxes of electrons with E greater than 40 KeV and E equal to 0.8 to 10 KeV) and density and temperature of ionospheric electrons and ions. Author (ESRO)

N72-33340# Auroral Observatory, Tromso (Norway).
HIGH LATITUDE IONOSPHERIC IRREGULARITIES OBSERVED BY MEANS OF SATELLITE BEACONS AND ROCKET PROBES Final Scientific Report, 1 Nov. 1969 - 31 Dec. 1971
Ove M. Bratteng and Jon Frihagen 20 Mar. 1972 26 p refs
(Contract F61052-70-C-0002; AF Proj. 4643-02)
(AD-745204; AFCRL-72-0328) Avail: NTIS CSCL 04/1

Numerous height measurements of ionospheric irregularities have shown them to be located in the region 300-600 km above the ground. Observations are presented which show that there is

no appreciable reduction in scintillation at 136 MHz when a satellite looses height from in excess of 1000 km to less than 300 km. Author (GRA)

N72-33341# Naval Research Lab., Washington, D.C.
PRELIMINARY INVESTIGATION OF THOMSON SCATTER RADAR AS AN AID TO HIGH FREQUENCY DIRECTION FINDING Final Report
John M. Goodman, Edgar L. Gott, Kenneth W. Morin, Melvin W. Lehman, and Edward Piernik 6 Jun. 1972 56 p refs
(AD-744948; NRL-7385) Avail: NTIS CSCL 04/1

During 1970-71, a set of experiments was carried out to determine the usefulness of Thomson scatter as an aid to direction finding. Twenty one experiments were conducted, and approximately 102 hours of radar operation were involved. Although the radar elevation angles employed were quite small (between 10 and 20 degrees), useful Faraday-rotation data were obtained, and skeleton electron-density profiles were constructed. It is shown that Thomson scatter can detect traveling ionospheric disturbances over a highly oblique radar ray trajectory. The format chosen to display the disturbances is a plot of Faraday rotation isopleths which exhibit height fluctuations as a function of time. From a consideration of the theory of neutral gravity waves, it is possible to relate F-layer height fluctuations to electron-density gradients in the horizontal plane. The knowledge of such gradients may be used to predict bearing-angle fluctuations induced by traveling ionospheric disturbances. Author (GRA)

N72-33342# Naval Research Lab., Washington, D.C.
ELECTRON-DENSITY PROFILES OF THE IONOSPHERE OBSERVED NEAR WASHINGTON, D. C. DURING THE SPRING OF 1971 Final Report
John M. Goodman, Melvin W. Lehman, Edgar L. Gott, Kenneth W. Morin, and Edward Piernik 7 Jun. 1972 41 p refs
(RR0080141)
(AD-744653; NRL-7395) Avail: NTIS CSCL 04/1

Radar Thomson scatter observations of the midday ionosphere over Randle Cliff have been made during March-May 1971. The correlation between various ionospheric parameters has been determined. Emphasis has been placed on the effect that magnetic activity has on the shape of the electron-density distribution. In general, following a magnetic impulse, the F2 maximum height is initially raised in proportion to the amount of magnetic activity, is subsequently lowered, and eventually returns to the equilibrium position. Also the F2 maximum density and the total electron content (below 600 km) decrease as the length of time between the magnetic-activity impulse and the measurement increases. This situation exists for at least a day; thereafter the diminution is reduced, and the profile gradually assumes its average shape. Author (GRA)

N72-33343# Army Electronics Command, Fort Monmouth, N.J.
ELECTRICAL CONDUCTIVITY STUDIES OF THE SOILS OF THE MIDDLE ATLANTIC REGION: VIRGINIA
William A. Hulse, John W. Walker, and Douglas C. Pearce Apr. 1972 16 p refs
(DA Proj. 1T0-61102-B-31-a)
(AD-744468; ECOM-3564) Avail: NTIS CSCL 08/13

Awareness of the perturbing effects of near-surface soils on local electromagnetic signal propagation has led to a program aimed at correlating electrical properties of soil with environmental factors. This information is expected to lead to a predictive capability for soils in militarily inaccessible regions. Such a capability is significant for remote sensor deployment, etc., in tactical situations. In the present study, the electrical conductivity of near-surface soils of Virginia was investigated as part of a study of the electrical behavior of the temperate soils of the Middle Atlantic Region of the United States. Author (GRA)

N72-33344# General Electric Co., Philadelphia, Pa. Space Div.
A COMPENDIUM OF OPTICAL INTERFEROMETER RESULTS ON SECEDE 2 Final Technical Report
Irwin M. Pikus and Gerald Liebling 31 Jan. 1972 61 p refs
(Contract F30602-71-C-0064; ARPA Order 1057; Proj. Secede)
(AD-744833; RADC-TR-72-122) Avail: NTIS CSCL 04/1

Project Secede is an ARPA program aimed at solving certain defense related problems through the study of chemical releases in the ionosphere. The chemical of primary interest has been barium. The aspects of the release which are of most interest include the growth of the cloud and the evolution of its striated structure. Several test series of releases have been conducted the latest of which was Secede II. The present report concerns data obtained during Secede II by an optical interferometer. The report consists of a number of data volumes and this one summary textual volume. Interferometer data on events Spruce, Olive, Redwood and Plum have been reduced and photographs of representative IO records on Spruce have been made. The interferometer data are presented in detail in the Event Data Books published separately while the IO records on Spruce are reproduced in this volume. Author (GRA)

N72-33345# Army Engineer Topographic Labs., Fort Belvoir, Va.
HIGH RESOLUTION ORTHOPHOTO OUTPUT TABLE
Maurits Roos Apr. 1972 33 p ref
(Contract DAAK02-67-C-0422)
(AD-744843; ETL-ETR-72-3) Avail: NTIS CSCL 08/2

The report covers the engineer testing and evaluation of a prototype production model of the High Resolution Orthophoto Output Table (HIROOT). This table was developed to provide the capabilities of 24- by 30-inch output format at a resolution of 100 lines per millimeter for the Universal Automatic Compilation Equipment. The table, its design and operation, the test procedures, and test results and their evaluation are described in the report. Author (GRA)

N72-33346# Science Resources Foundation, Watertown, Mass.
POLAR CAP SPECTRAL EMISSION INTENSITIES AND THEIR RELATIONSHIP TO SELECTED GEOMAGNETIC PARAMETERS Final Report, 1 Apr. - 30 Nov. 1971
John H. Frey, William L. Fischer, and David L. Miller 31 Mar. 1972 89 p refs
(Contract F19628-71-C-0179; AF Proj. 7661)
(AD-743941; AFCRL-72-0205) Avail: NTIS CSCL 04/1

Selected spectral emission data from the One Meter Fastie-Ebert Scanning Spectrometer located at the AFCRL Geopole Station, Thule, Greenland have been scaled and analyzed. The autocorrelation power spectral density and diurnal variation of the emission have been examined. Linear correlations have been performed between emissions by month and UT hour, by season and by total data set. Linear correlations between emissions and selected geomagnetic parameters have also been performed. The indeterminacy of results due to the occurrence of zeros in the data is discussed. Author (GRA)

N72-33347# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
SOILS OF THE CARIBOU-POKER CREEKS RESEARCH WATERSHED, INTERIOR ALASKA
Samuel Rieger, Clarence E. Furbush, Dale B. Schoephorster, Harry Summerfield, Jr., and Luther C. Geiger Apr. 1972 22 p
(AD-744451; CRREL-TR-236) Avail: NTIS CSCL 08/13

Soils of the 41.5 sq miles Caribou-Poker Creeks Research Watershed, central Alaska, have been mapped by standard Soil Conservation Service (USDA) methods. Seven soil series are recognized: Bradway silt loams, Ester silt loams, Karshner silt loams and Saulich silt loams, all underlain by permafrost at shallow depth, make up 27% of the basin area. Olnes silt loams, Gilmore silt loams and Fairplay silt loams, covering 73% of the watershed area, are free from permafrost. Areal distribution of soils is depicted on a photo-mosaic base at 1:31, 680 scale. Author (GRA)

N72-33348# Teledyne Geotechnical, Alexandria, Va.
A GEOPHYSICAL EVALUATION OF THE SHORT PERIOD LASA/SAAC SYSTEM
W. C. Dean 26 May 1972 43 p refs
(Contract F33615-71-C-0510; ARPA Order 1620)
(AD-745101; SAAC-TR-5) Avail: NTIS CSCL 17/10

The report presents a geophysical evaluation of the short-period LASA/SAAC system as it operated during 1971. The system operates in two parts. The Detection Processor (DP) performs data acquisition and signal detection in an on-line computer. Throughout 1971 DP operated with a detection threshold of 10 db signal/noise ratio where the signal measurements are equivalent to zero to peak, and noise measurements are 28.8 second averages of filtered beams. The average DP detection rate was 450 signals per day.
Author (GRA)

N72-33349# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SEISMIC DISCRIMINATION BY HARMONIC ANALYSIS TECHNIQUES M.S. Thesis
William Rayoul Youngblood Mar. 1972 85 p refs
(AD-743317; GE/EE/72-29) Avail: NTIS CSCL 08/11

A large set of short period earthquake and underground nuclear explosion teleseismic signals (recorded at LASA) were analyzed using bands of the Discrete Fourier Transform coefficients and a pattern recognition system. The earthquakes, from several regions, ranged in magnitude from 4.1 to 6.1, and included shallow and deep events. The explosions ranged in magnitude from 4.7 to 6.3, and included US, Soviet, and French shots. Best results were 88.9% of the earthquakes and 100% of the explosions correctly identified. Furthermore, when deep and unknown depth earthquakes were excluded, only one earthquake was misidentified.
Author (GRA)

N72-33350# Naval Postgraduate School, Monterey, Calif.
THE DEVELOPMENT OF A HOMOGENEOUS NUMERICAL OCEAN MODEL FOR THE ARCTIC OCEAN
J. A. Galt Jul. 1972 51 p refs
(AD-744925; NPS-58G172071A) Avail: NTIS CSCL 08/3

A numerical ocean model driven by surface stress and a source-sink distribution is developed for a homogeneous ocean. Non-linearities, lateral friction and bottom friction are included. The basin shape can be varied to accommodate a large variety of configurations. Variable bathymetry and sources/sinks around the perimeter are included. The numerical scheme is conditionally stable and has second order accuracy in space and time. A number of test cases are run to explore the dynamic significances of the various processes represented. The possible influence of these processes on the circulation of the Arctic Ocean are discussed.
Author (GRA)

N72-33351# Clemson Univ., S.C. Dept. of Civil Engineering.
A STATE OF THE ART SURVEY OF THE APPLICATIONS OF AERIAL REMOTE SENSING TO COASTAL ENGINEERING
Donald B. Stafford May 1972 193 p
(Contract DACW72-70-C-0034)
(AD-744479) Avail: NTIS CSCL 08/6

The report presents the results of a comprehensive survey of the applications of aerial remote sensing techniques in the field of coastal engineering. Part 1 presents a narrative summary of the state of the art of coastal engineering applications of aerial remote sensors. Existing and potential applications of the techniques are described. Important characteristics of the various aerial remote sensors and the limitations of the techniques in coastal engineering applications are discussed. The primary aerial remote sensors considered are black and white, black and white infrared, color, and color infrared aerial photographs, satellite photographs, infrared imagery, multispectral imagery, and radar imagery. Part 2 is an annotated bibliography describing the coastal engineering applications of aerial remote sensing techniques. This is a representative compilation of literature written over the past 30 years. A variety of coastal engineering applications of aerial remote sensors are described. Approximately 200 references are listed in the annotated bibliography.
Author (GRA)

N72-33352# Weather Wing (4th), Ent AFB, Colo.
MORPHOLOGY OF A SOLAR-TERRESTRIAL EVENT IN LATE SEPTEMBER AND EARLY OCTOBER 1969
Clement J. Thomas May 1972 60 p refs
(AD-744883; Rept-4WW-TM-72-1) Avail: NTIS CSCL 04/1

The report looks at the geomagnetic and ionospheric disturbances that were associated with solar flares on 25 and 27 September 1969. The terrestrial responses to these two solar events were considerably different. To better understand these differences, the events are related to some of the contemporary geophysical theories. The specific results of this study reinforce the general conclusions reached in previous ionospheric morphologies. The reason for the different F-region effects of these events appears to be dependent upon the pre-event magnetospheric conditions.
Author (GRA)

N72-33353# Datatronic Systems Corp., Panorama City, Calif. Computer Sciences and Environmental Technology Div.
ENVIRONMENTAL QUALITY: A CHALLENGE FOR ACHIEVEMENT Final Report
Michael P. Milane 7 Apr. 1972 31 p
(PB-209744; DC-72-10177) Avail: NTIS HC $3.00 CSCL 13B

The role of the chemist in improving environmental quality demands that he must be aware of what the environmental problems are. He must be aware of what can be done to alleviate the environmental problems of air pollution, water pollution, and solid waste management. And he must apply his expertise to solve the many complex problems associated with the increasingly important national concern for environmental quality. The presentation is an overview of what's going on in the technology associated with environmental pollution, current facts on the environment, what the chemist can do to alleviate problems in environmental pollution, and a challenge to apply several alternatives to insure tomorrow's environmental quality.
Author (GRA)

N72-33354# Geonautics, Inc., Washington, D.C.
ACOUSTIC REFLECTION PROFILES: LIBERIAN CONTINENTAL MARGIN
J. S. Schlee 1972 91 p refs
(PB-209871; USGS-GD-72-006) Avail: NTIS HC $3.00 CSCL 08G

Unedited subbottom acoustic reflection profiles are presented of Leg 3 of an international cruise performed by the U.S. Geological Survey under a program designated the International Decade of Ocean Exploration. Approximately 5400 km of track line was run along the Liberian continental margin. The geological seeting, preliminary results, and types of equipment used are described, the profiles are reproduced, and hourly location data are provided on a detailed trackline map.
Author (GRA)

N72-33355# Michigan Univ., Ann Arbor. High Altitude Engineering Lab.
ANALYSIS AND TESTS OF MYLAR FALLING SPHERES Final Report, 15 Apr. 1970 - 15 Dec. 1971
Frederick F. Fishchbach, Harold F. Allen, and Fred L. Bartman 15 Dec. 1971 187 p refs
(Contract F19628-70-C-0245; AF Proj. 6682)
(AD-743927; Rept-036140-1-F; AFCRL-71-0571) Avail: NTIS CSCL 04/1

The analysis and tests of mylar falling spheres described herein contain results on several theoretical and experimental factors related to the success of the falling sphere program. A careful study of the literature and experimental methods used to obtain sphere drag coefficients has led to recommended tables of sphere drag coefficients. Studies of flight experience and theoretical studies of initial sphere temperatures, isopentane

evaporation, radiation effects, convective heat transfer to the atmosphere, heat transfer within the sphere and chemical reaction on the sphere surface provide information which may possibly be used in future work to compute a realistic reliable temperature-time history of falling spheres. The results of the Viper-Dart sphere test program suggest that thermal problems during the rocket ascent or during sphere ejection and inflation may be the principal cause of flight failures of falling spheres. Remedies are suggested. Author (GRA)

N72-33356# Germantown Labs., Inc., Philadelphia, Pa.
CHEMICAL REACTION STUDIES RELATED TO THE UPPER ATMOSPHERE Final Report, 1 Dec. 1970 - 1 Dec. 1971
Charles S. Stokes, Edward W. Smith, and William J. Murphy 1 Dec. 1971 28 p
(Contract F19628-71-C-0097; AF Proj. 7635)
(AD-743926; GLI-1971-6; AFCRL-72-0107) Avail: NTIS CSCL 04/1

The production of magnesium and magnesium oxide vapor has been investigated via the reactions: Mg + CuO to Cu + MgO and Mg Excess + CuO to Cu + Mg + MgO. The studies were carried out at a simulated altitude of 75 Km. using 10 to 15 gm charges in a small cartridge with a burst disk of various thicknesses to vary the internal pressure. Temperature, burning time, internal pressure, emission spectra and ignition characteristics were moderated. Author (GRA)

N72-33357# California Inst. of Tech., Pasadena.
EXPERIMENTAL AND ANALYTICAL STUDIES OF COLLISION-FREE PLASMA FLOWS Final Report, 1 Apr. 1966 - 30 Jun. 1971
Lester Lees 30 Dec. 1971 14 p refs
(Contract F19628-70-C-0152; AF 33(615)-5012; AF Proj. 8608)
(AD-745166; AFCRL-72-0074) Avail: NTIS CSCL 04/1

Collision-free plasma flow phenomena have been investigated experimentally and analytically. An experiment on the effect of the charge exchange collisions between streaming ions and background neutral atoms and measurements of wakes behind simple bodies were conducted in a low-density plasma beam facility under carefully controlled laboratory conditions, in close coordination with theoretical analysis. Author (GRA)

N72-33358# Coast Guard, Washington, D.C. Oceanographic Unit.
OCEANOGRAPHIC OBSERVATIONS, NORTH ATLANTIC OCEAN STATION ECHO
Alan D. Rosebrook Dec. 1971 352 p refs
(PB-209201; USCG-373-49; Rept-49) Avail: NTIS HC $6.00 CSCL 08J

Observed and interpolated temperature and salinity data, plus computed sigma-t values, geopotential anomalies and sound velocities, are presented for 315 oceanographic stations occupied by U.S. Coast Guard cutters at Ocean Station ECHO (centered at 35 00 N, 48 00 W) during November 1967-December 1968. Profiles of temperature versus depth and salinity versus depth, as well as a plot of temperature versus salinity are presented for each of the 14 patrols. Plots of temperature versus time and salinity versus time at slected depths are presented and analyzed to describe annual temperature and salinity cycles at ECHO. The presence of Mediterranean water at intermediate depths, and a series of temperature and salinity cycles with periods of 2 to 3 months at depths between 200 and 700 m are noted. Author (GRA)

N72-33359# Coast Guard, Washington, D.C. Oceanographic Unit.
OCEANOGRAPHY OF THE GRAND BANKS REGION AND THE LABRADOR SEA
Martin J. Moynihan and Henry S. Andersen Dec. 1971 268 p
(PB-209200; USCG-373-48; Rept-48) Avail: NTIS HC $3.00 CSCL 08J

Oceanographic surveys off the Grand Banks of Newfoundland during April to June 1969 in support of the International Ice Patrol are discussed. In addition, two occupations of a section across the Labrador Sea from South Wolf Island, Labrador, to Cape Farewell, Greenland, are described. The circulation of the Grand Banks region based on dynamic topography charts and variations in the density and volume transport of the Labrador Current is discussed. Volume transports, mean temperatures, and heat transports of the Labrador and West Greenland Currents from 1948 through 1969 are presented. Author (GRA)

N72-33360# Geological Survey, Menlo Park, Calif.
A FORTRAN IV COMPUTER PROGRAM FOR CALCULATING BOREHOLE GRAVITY TERRAIN CORRECTIONS
L. A. Beyer and C. E. Corbato (Ohio State Univ., Columbus.) Mar. 1972 30 p refs
(PB-208679; USGS-GD-72-018) Avail: NTIS CSCL 08G

The computer program described in this report calculates terrain corrections at equally or unequally spaced gravity stations in a vertical borehole (or on a tower above ground) and also calculates vertical gradients and density corrections over intervals between stations for analysis of borehole gravity measurements. Terrain must be described by a standard scheme (e.g., Hayford-Bowie, Hammer) or a special zone and compartment scheme. Terrain density may be specified as constant for all zones or as variable by compartment. An approximate correction for the earth's curvature is included. Author (GRA)

N72-33361# Bureau of Mines, Denver, Colo.
COMPUTER ANALYSIS OF SEISMIC REFRACTION DATA
James H. Scott, Richard G. Burdick, and Benton L. Tibbetts Mar. 1972 99 p refs
(PB-208770; BM-RI-7595) Avail: NTIS; SOD $1.00 as 2404-1049 CSCL 08K

A technique of seismic refraction data analysis has been developed in which a digital computer is used to generate a two-dimensional model representing a layered-earth depth interpretation. Travel times are picked on seismic records by the human interpreter. These times, together with shot point and geophone locations and refraction layer control information, are submitted to the computer on punched cards. A first approximation delineation of each refraction horizon is obtained by a computer adaption of the delay time method. The approximation is then tested and improved by the computer through the use of a ray tracing procedure in which ray travel times computed for the model are compared against field measured travel times. Author (GRA)

N72-33362# Boston Coll., Chestnut Hill, Mass.
EVALUATION OF SEISMIC INSTRUMENTATION AND PRELIMINARY ANALYSIS OF SEISMIC NOISE DATA Final Report, 1 Sep. 1968 - 31 Oct. 1971
John G. Hogan, Joseph J. Blaney, Jane F. Carlson, Howard Kuenzler, and Thomas D. N. Douthit Apr. 1972 151 p refs
(Contract F19628-69-C-0011; AF Proj. 7639)
(AD-743954; AFCRL-72-0267) Avail: NTIS CSCL 08/11

Three real time data acquistion systems are described. A description of two peripheral interfaces for the micro-LINC is presented. The programs used in the construction of this Long Term Gyro Test data library are described. A modification of the on-off recording sequence of the Portable Seismic Array system is described. Author (GRA)

N72-33363# Edgerton, Germeshausen and Grier, Inc., Bedford, Mass.
SECEDE II STRIATION ANALYSIS Semiannual Technical Report, Jul. 1971 - Jan. 1972
Harold J. Linnerud, Lawrence H. Leonard, and Edward P. Marram Griffiss AFB, N. Y. RADC Apr. 1972 41 p
(Contracts F30602-71-C-0015; ARPA Order 1057)
(AD-745572; RADC-TR-72-130) Avail: NTIS CSCL 04/1

To support SECEDE II data analysis and interpretation,

EG-G (Bedford Division) is analyzing photographic data from the Spruce Event. Fourier analysis of digitized data frames will produce power spectra, auto-correlation functions, and other such data as is appropriate for event interpretation and correlation. The concept of Fourier analysis is also being examined to establish the validity and usefulness of the analysis results.
Author (GRA)

N72-33364# Coast Guard, Washington, D.C.
OCEANOGRAPHIC SURVEY OF THE GULF OF ANADYR, AUGUST 1970
Gary L. Hufford and David M. Husby Apr. 1972 64 p refs
(PB-210179; USCG-373-52) Avail: NTIS HC $3.00 CSCL 08J

An oceanographic investigation during August 1970 in the Gulf of Anadyr was conducted from the USCGC Northwind. Distribution of temperature, salinity, dissolved oxygen, inorganic phosphate, nitrate, nitrite, and silicate are described and interpreted. Origin of cold bottom water pockets in the Gulf is discussed.
Author (GRA)

N72-33365# East Tennessee State Univ., Johnson City.
DELINEATION OF INFORMATION REQUIREMENTS OF THE TVA WITH RESPECT TO REMOTE SENSING DATA Final Report
John B. Rehder Dec. 1971 21 p refs
(PB-210114; USGS-DO-72-005; USGS-IR-235) Avail: NTIS HC $3.00 CSCL 13B

The information needs and interests of TVA that can be supplied by hyper-altitude imagery and future ERTS-A satellite imagery were determined by interviews. Two series of interviews were used to obtain specific data requirements as they pertain to the kinds of information expected and were particularly keyed to the topics of information needed, the variation of scales and coverage involved between aircraft and satellite platforms, and temporal considerations.
Author (GRA)

N72-33366# Athens Univ. (Greece). Electronic Div.
THE 40 MHz IONOSPHERIC SCINTILLATION AND THE SPORADIC E LAYER Final Scientific Report, 1 Mar. 1968 - 28 Feb. 1970
Michael Anastassiadis Mar. 1972 21 p refs
(Contract F61052-68-C-0038; AF Proj. 4643)
(AD-745592; AFCRL-72-0269) Avail: NTIS CSCL 20/14

Simultaneous observation of minute-by-minute ionograms and signal amplitude recordings from Explorer 22 (BE-B) have shown a marked coincidence of high scintillation indices and a height spreading of the sporadic E trace. These observations, carried out at Athens (37 degrees 58 minutes N, 23 degrees 43 minutes E) over a period of 18 months lead to the conclusion that the existence of spreading is usually associated with strong scintillation.
Author (GRA)

N72-33367# Woods Hole Oceanographic Institution, Mass.
ADVANCED MARINE TECHNOLOGY Technical Progress Report, 1 Feb. - 31 Jul. 1971
Wilfred B. Bryan, Carl O. Bowin, Robert D. Ballard, Joseph D. Philips, Allyn C. Vine, Frederick R. Hess, John M. Teal, William M. Marquet, Elazar Uchupi, Peter H. Wiebe et al 29 Feb. 1972 82 p refs
(Contract N00014-71-C-0284; ARPA Order 293-008)
(AD-744025; WHOI-72-33) Avail: NTIS CSCL 08/10

The report describes progress on the following projects in Advanced Marine Technology: submerged navigation and submersible instrumentation (development of precise navigation for a small submersible), handling and transfer at sea (use of energy absorbers in small boat and buoy handling alongside in rough weather), bottom reconnaissance and detailed site surveys (use of submersible in geological mapping), near bottom magnetic studies from a deep submersible, near bottom gravity studies from a deep submersible, deep sea rock drill and heat flow instrument for use from submersible, deep ocean biological research (observation and collection under pressure of benthic biology), offshore monitoring of industrial waste (use of gas chromatographic techniques to determine pollutants in sea water), and air sea systems (use of air-dropped arrays of sonobuoys and explosives for seismic reflection, refraction and side-scan echo ranging).
Author (GRA)

N72-33368# East Tennessee State Univ., Johnson City.
BIBLIOGRAPHY OF REMOTE SENSING APPLICATIONS FOR PLANNING AND ADMINISTRATIVE STUDIES
Nelson R. Nunnally Dec. 1971 76 p refs Sponsored by Geol. Survey Prepared for TVA
(PB-209633; USGS-DO-72-008; USGS-IR-234) Avail: NTIS HC $4.85 CSCL 13B

The annotated bibliography is representative of the material available, both published and unpublished, and covers the entire spectrum of application in terms of methodology, techniques, and procedures, and all types of sensing systems. It is selective in that the authors have attempted to respect the best of articles covering the same application, and to present different viewpoints.
GRA

N72-33369# Danish Meteorological Inst., Copenhagen. Geophysics Section.
SEASONAL, DIURNAL AND MAGNETIC DEPENDENCE OF IONOSPHERIC TOTAL ELECTRON CONTENT AT 63 DEGREES INVARIANT LATITUDE Final Report, 1 Mar. 1969 - 31 Oct. 1971
IB Steen Mikkelsen Apr. 1972 14 p refs
(Contract F61052-69-C-0019; AF Proj. 4643)
(AD-745325; AFCRL-72-0365) Avail: NTIS CSCL 04/1

The total ionospheric electron content at 63 degrees invariant latitude shows a strong seasonal dependence. The diurnal variation is smallest during summer, whereas the winter-months show the highest day-values as well as the lowest night-values. Next, the electron-content shows a 27-days cycle, which is well correlated with the variations of the solar-flux in the cm-band. The night-values of the summer-data show a marked tendency to decrease with increasing Kp-values.
Author (GRA)

N72-33370# Teledyne Geotechnical, Alexandria, Va. Seismic Data Lab.
PRELIMINARY EVALUATION OF THE ALASKAN LONG-PERIOD ARRAY
D. M. Clark, R. P. Masse, and J. E. Dunavant 19 Jan. 1972 158 p refs
(Contract F33657-72-C-0009; ARPA Order 1714)
(AD-745596; SDL-281) Avail: NTIS CSCL 17/10

The object of this study was to determine the characteristics of signals and noise as recorded at the Alaska Long Period Array (ALPA), and to evaluate the performance of signal processing techniques using data from this array. Only a partial array of five to eight sites was available for analysis. Results are discussed.
Author (GRA)

N72-33371# East Tennessee State Univ., Johnson City.
A MODEL FOR PHOTOMORPHIC ANALYSIS, TENNESSEE VALLEY TEST SITE Final Report
Donald D. MacPhail and Yuk Lee Feb. 1972 37 p refs Sponsored by Geol. Survey
(PB-209683; USGS-DO-72-006; IR-USGS-236) Avail: NTIS HC $3.00 CSCL 08F

In order to determine the utility of the photomorphic concept of landscape analysis to the TVA for use in regional planning, a model for analysis is necessary. The methodology and sampling techniques to be used in conjunction with a demonstration project using the photomorphic concept include: identifying photomorphic patterns on black and white, intermediate-scale imagery; reducing these data to base map scale; selecting sample areas; and quantitatively measuring and testing the physical and cultural features such as drainage density, soil moisture, mean farm size, percent of vegetation

cover, and population density to determine the validity of the photomorphic mapping. Author (GRA)

N72-33372# Texas Instruments, Inc., Dallas. Services Group.
EXTENDED ARRAY EVALUATION PROGRAM. SPECIAL REPORT NO. 2: RESOLUTION AND STABILITY OF WAVENUMBER SPECTRAL ESTIMATES
Aaron H. Booker and Chung-yen Ong 30 Apr. 1972 52 p refs
(Contract F33657-71-C-0843; ARPA Order 1714; AF Proj. 1705; Proj. Vela Uniform)
(AD-745195; TI-SR-2) Avail: NTIS CSCL 17/10

The relative resolution and stability of conventional and new methods of spectral estimation are investigated. Techniques considered are conventional beamsteer, maximum likelihood, maximum entropy and principle components. These techniques are evaluated using both synthetic data and real seismic data from the TFO extended short-period array. Author (GRA)

N72-33373# Texas Instruments, Inc., Dallas. Services Group.
EXTENDED ARRAY EVALUATION PROGRAM. SPECIAL REPORT NO. 3: ARRAY PROCESSING OF ALASKAN LONG-PERIOD ARRAY DATA
Leo N. Heiting and Chung-yen Ong 30 Apr. 1972 38 p refs
(Contract F33657-71-C-0843; ARPA Order 1714; AF Proj. 1705; Proj. Vela Uniform)
(AD-745196; TI-SR-3) Avail: NTIS CSCL 17/10

The effectiveness of various array processors for the extraction of long-period Array data has been investigated. The types of processors discussed include frequency-domain and time-domain optimal multi-channel filters, adaptive filters, beamsteer and weighted beamsteer. It has been concluded that conventional multi-channel filter processors do not provide results superior to simple beamsteer processors when applied to ALPA data. There is some suggestion that on occasion adaptive multi-channel filters or weighted beamsteer processors have some advantage over beamsteer processors. Author (GRA)

N72-33374# Texas Instruments, Inc., Dallas. Services Group.
EXTENDED ARRAY EVALUATION PROGRAM. SPECIAL REPORT NO. 4: EVALUATION OF DETECTION AND DISCRIMINATION CAPABILITY OF THE ALASKAN LONG PERIOD ARRAY
Leo N. Heiting, Gary D. McNeely, and Alan C. Strauss 30 Apr. 1972 110 p refs
(Contract F33657-71-C-0843; ARPA Order 1714; AF Proj. 1705; Proj. Vela Uniform)
(AD-745197; TI-SR-4) Avail: NTIS CSCL 17/10

The report describes the continued evaluation of the 19-element Alaskan Long Period Array (ALPA). The major areas of study in the evaluation were: Signal analysis: Noise analysis; Two component processing gains; Matched filter processing gains; ALPA detection and discrimination; Surface wave detection; Performance of standard discriminants at ALPA. Author (GRA)

N72-33375# Texas Instruments, Inc., Dallas. Services Group.
EXTENDED ARRAY EVALUATION PROGRAM. SPECIAL REPORT NO. 6: PRELIMINARY EVALUATION OF THE NORWEGIAN SHORT PERIOD ARRAY
Thomas E. Barnard and Richard L. Whitelaw 30 Apr. 1972 104 p refs
(Contract F33657-71-C-0843; ARPA Order 1714; AF Proj. 1705)
(AD-745198; TI-SR-6) Avail: NTIS CSCL 17/10

The report presents results from the preliminary evaluation of the Norwegian short-period Seismic Array. A description of the array itself and the data base for the evaluation is followed by discussion of noise characteristics, signal characteristics, array processing performance, detection capability, and discriminant performance. Author (GRA)

N72-33376# Texas Instruments, Inc., Dallas. Services Group.
EXTENDED ARRAY EVALUATION PROGRAM. SPECIAL REPORT NO. 7: PRELIMINARY EVALUATION OF SINGLE STATIONS OF THE LONG PERIOD EXPERIMENT NETWORK
Stephen A. Benno 17 Apr. 1972 84 p refs
(Contract F33657-71-C-0843; ARPA Order 1714; AF Proj. 1705)
(AD-745199; TI-SR-7) Avail: NTIS CSCL 17/10

Data are presented from a preliminary evaluation of seven stations of the Very Long Period Experiment network; Australia, Thailand, Alaska, Spain, Israel, Norway, and Ogdensburg. For each station a limited amount of signal and noise data have been digitally processed, and results are shown describing the RMS noise levels, noise spectral content, surface wave detection capability and behavior of the M sub s - m sub b discriminant. Also, preliminary results of a comparison between M sub s computed at 20 and 40 seconds are presented. Author (GRA)

N72-33781* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE MEASUREMENTS WITH MICROWAVE, RADIOMETERS
Thomas J. Schmugge *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 3-6 (For availability see N72-33780 24-30)
CSCL 08M

N72-33782* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MINERAL EXPLORATION FROM HIGH ALTITUDE IMAGERY
Herbert W. Blodget *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 7-12 ref (For availability see N72-33780 24-30)
CSCL 08G

N72-33783* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARCTIC ICE MEASUREMENTS WITH MICROWAVE RADIOMETERS
Per Gloersen *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 13-18 (For availability see N72-33780 24-30)
CSCL 08L

N72-33784* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MULTISPECTRAL METHOD OF DETERMINING SEA SURFACE TEMPERATURES
William E. Shenk *In its* Significant Accomplishemnts in Sci., 1971 Jun. 1972 p 19-23 (For availability see N72-33780 24-30)
CSCL 08J

N72-33785* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENTS OF OCEAN COLOR
Warren A. Hovis *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 24-29 (For availability see N72-33780 24-30)
CSCL 08J

N72-33787* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATOSPHERIC OZONE
Richard W. Stewart *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 34-36 ref (For availability see N72-33780 24-30)
CSCL 04A

N72-33788* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VERTICAL MOTIONS INFERRED FROM SATELLITE RADIOMETRY
Vincent V. Salomonson *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 37-41 (For availability see N72-33780 24-30)
CSCL 04A

N72-33791* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GLOBAL HYDROGEN BUDGET
Henry C. Brinton *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 52-57 refs (For availability see N72-33780 24-30)
CSCL 04A

N72-33792* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC CONTROL OF THE HIGH LATITUDE THERMOSPHERE
Alan E. Hedin *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 58-61 (For availability see N72-33780 24-30)
CSCL 04A

N72-33793* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW VIEW OF THE RING CURRENT
Masahisa Sugiura *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 62-66 refs (For availability see N72-33780 24-30)
CSCL 03B

N72-33794* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MAGNETOSPHERIC PLASMA TAIL
Joseph M. Grebowsky *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 67-70 (For availability see N72-33780 24-30)
CSCL 03B

N72-33795* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC FIELD OBSERVATIONS OF THE DAYSIDE POLAR CUSP
Donald H. Fairfield *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 71-74 ref (For availability see N72-33780 24-30)
CSCL 03B

N72-33796* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT PROBE MEASUREMENTS OF dc ELECTRIC FIELDS FROM IMP 1
Thomas L. Aggson *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 75-78 (For availability see N72-33780 24-30)
CSCL 03B

N72-33965 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
GRADIENT COMPENSATION
C. D. Harduck *In* NRC of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 1-14 (For availability see N72-33964 24-34)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N72-33377* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADJUSTABLE FORCE PROBE Patent
Walter E. Kaspareck, Ben B. Swords, and Werner K. Rosinski, inventors (to NASA) Issued 26 Sep. 1972 6 p Filed 17 Dec. 1970 Supersedes N72-15431 (10 - 06, p 0772)
(NASA-Case-MFS-20760; US-Patent-3,693,418; US-Patent-Appl-SN-99174; US-Patent-Class-73-85; US-Patent-Class-73-141AB) Avail: US Patent Office CSCL 14B

A hand operated force probe is described. The probe applies a preset force against an object to determine if the object is properly secured. The construction of the device and its method of operation are presented. P.N.F.

N72-33378*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
A PRELIMINARY DESIGN STUDY FOR A COSMIC X-RAY SPECTROMETER Final Report
1 Jul. 1972 127 p refs
(Contract NAS8-24585)
(NASA-CR-123910) Avail: NTIS HC $8.50 CSCL 14B

The results are described of theoretical and experimental investigations aimed at the development of a curved crystal cosmic X-ray spectrometer to be used at the focal plane of the large orbiting X-ray telescope on the third High Energy Astronomical Observatory. The effort was concentrated on the development of spectrometer concepts and their evaluation by theoretical analysis, computer simulation, and laboratory testing with breadboard arrangements of crystals and detectors. In addition, a computer-controlled facility for precision testing and evaluation of crystals in air and vacuum was constructed. A summary of research objectives and results is included. F.O.S.

N72-33379*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPARATUS FOR CONTROLLING THE TEMPERATURE OF BALLOON BORNE EQUIPMENT Patent Application
Milton Schach and Jack J. Triolo, inventors (to NASA) Filed 14 Aug. 1972 18 p
(NASA-Case-GSC-11620-1; US-Patent-Appl-SN-280305) Avail: NTIS HC $3.00 CSCL 14B

The development of a temperature control device for use with balloon-borne equipment is discussed. The device will control the temperature of batteries and electronic instrumentation packages carried by balloons to high altitudes. The configuration of the Mylar enclosure contains the radiant energy emitted by the earth and its atmosphere and reflects the radiation emitted by the instrumentation package, thus reducing the heat loss.
NASA

N72-33380*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ACTUATOR PARTICIPATION IN A BENDING MODE IDENTIFICATION SYSTEM
Zack Thompson and Perry Davis Sep. 1972 19 p refs
(NASA-TM-X-64689) Avail: NTIS HC $3.00 CSCL 14B

A hydraulic actuator designed for a thrust vector control system used as a shaker for a vehicle to determine the bending mode frequencies is described. The actuator is used as the prime mover and the frequency sensor for the flexible vehicle in a test

tower. Advantages in using the actuator piston position with respect to a commanded position to obtain the bending mode frequencies are shown. Author

N72-33381*# Itek Corp., Lexington, Mass. Optical Systems Div.
OUTER PLANETS MISSION TELEVISION SUBSYSTEM OPTICS STUDY Final Report, Jan. - Jun. 1972
28 Jul. 1972 182 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953320)
(NASA-CR-128322; Itek-72-9320-1) Avail: NTIS HC $11.25 CSCL 20F

An optics study was performed to establish a candidate optical system design for the proposed NASA Mariner Jupiter/Saturn 77 mission. The study was performed over the 6-month period from January through June 1972. The candidate optical system contains both a wide angle (A) and a narrow angle (B) lens. An additional feature is a transfer mirror mechanism that allows image transfer from the B lens to the vidicon initially used for the A lens. This feature adds an operational redundancy to the optical system in allowing for narrow angle viewing if the narrow angle vidicon were to fail. In this failure mode, photography in the wide angle mode would be discontinued. The structure of the candidate system consists mainly of aluminum with substructures of Invar for athermalization. The total optical system weighs (excluding vidicons) approximately 30 pounds and has overall dimensions of 26.6 by 19.5 by 12.3 inches. Author

N72-33382*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELECTRON CALIBRATION OF A HIGH ENERGY COSMIC RAY DETECTOR
George M. Simnett, Robert F. Silverberg, Carol Jo Crannell (Federal City Coll.), Roger A. Gearhart (Stanford Linear Accelerator Center), Frank A. Hagen (Md. Univ., College Park), W. V. Jones (La. State Univ., Baton Rouge), Richard J. Kurz, Jonathan F. Ormes, and Robert D. Price Sep. 1972 51 p refs Submitted for publication
(Grants NGR-09-050-001; NGL-21-002-033)
(NASA-TM-X-66049; X-661-72-329) Avail: NTIS HC $4.75 CSCL 14B

The spectrum of cosmic ray electrons above 10 GeV was studied extensively. The spectrum is predicted to steepen at an energy which is related to the lifetime of electrons in the interstellar medium against losses due to inverse Compton collisions with photons and to synchrotron radiation in galactic magnetic fields. The experimental results diverge widely; the lack of agreement between the various measurements is due to a variety of experimental problems. Author

N72-33383*# Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
LABORATORY AND FIELD EVALUATION OF AN UNDERWATER SAND HEIGHT GAGE
Donald J. P. Swift and Dennis G. McGrath 30 Apr. 1972 21 p
(Contract NAS1-9434)
(NASA-CR-112163; TR-4) Avail: NTIS HC $3.25 CSCL 14B

An underwater sand height gage was investigated. This instrument consisted of two transducers, one screened and one unscreened. Laboratory experimentation included static and dynamic tests with three test sands--fine, medium, and coarse. Field tests were conducted at Rudee Inlet, Virginia Beach, Virginia. Test results showed a linear response to up to 10 inches of sand loading. Deviation observed in identical tests appeared to be due to variation in the density of sand. Density differences reflected varying packing styles which, in turn, were a consequence of grain size and flow regime. Further evaluations of the sand height gage reflect this instrument's potential. Author

N72-33384*# National Bureau of Standards, Washington, D.C. Heat Div.
OPTICAL RADIATION MEASUREMENTS: FUNDAMENTAL PRINCIPLES OF ABSOLUTE RADIOMETRY AND THE PHILOSOPHY OF THIS NBS PROGRAM (1968 TO 1971)
Jon Geist Jun. 1972 60 p refs
(NASA Order C-41584-B)
(NASA-CR-128352; NBS-TN-594-1) Avail: NTIS; SOD $0.60 as C 13.46:594-1 CSCL 14B

The philosophy of the present NBS program in realizing a scale of total irradiance with electrically calibrated (absolute) detectors, a theoretical analysis of the sources of error in such a scale realization, a description of the electrically calibrated detector developed from 1968 to 1971, and participation in the Third International Pyrheliometer Comparison are presented. Author

N72-33385*# National Aeronautics and Space Administration, Washington, D.C.
CHROMATOGRAPHIC DETECTORS FOR ANALYSIS OF GASES AND VAPORS OF ORGANIC SUBSTANCES IN THE ATMOSPHERES OF THE EARTH AND PLANETS
V. V. Brazhnikov and V. A. Rotin Oct. 1972 34 p refs Transl. into ENGLISH of "Khromatograficheskiye Detektory Dlya Analiza Gazov Parov Organicheskikh Veshchestv v. Atmosferakh Zemli i Planet", report Pr-100, Acad. of Sci., Inst. of Space Res., Moscow, 1972 p 48
(NASA-TT-F-14598; PR-100) Avail: NTIS HC $3.75 CSCL 14B

Practical and currently used gas detectors are discussed. Primary emphasis is placed on adapting such detectors for use in spacecraft and for use in unmanned probes. Each type of detector is discussed and its advantages and limitations are set forth. Author

N72-33386*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ROTATING PRESSURE MEASURING SYSTEM FOR TURBINE COOLING INVESTIGATIONS
Frank G. Pollack, Curt H. Liebert, and Victor S. Peterson Washington Oct. 1972 20 p refs
(NASA-TM-X-2621; E-7016) Avail: NTIS HC $3.00 CSCL 14B

The development of a 10-channel rotating pressure measuring system capable of operation to speeds of 9000 rpm at transducer temperatures of about 320 K (120 F) is described. Variable-reluctance pressure transducers were mounted in the rotating system for sensing pressure. Rotating performance tests on a spin rig showed that the output data from 7 of the 10 transducers tested were within a desired system error of 3 percent. However, the error of the output data from three other transducers was as large as 8 percent of 9000 rpm. It was concluded from these test results that a rotating screening method was necessary to evaluate each pressure transducer channel within a system that will be used under rotating conditions. Author

N72-33387*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
WIND TUNNEL MEASUREMENTS OF SURFACE PRESSURE FLUCTUATIONS AT MACH NUMBERS OF 1.6, 2.0, AND 2.5 USING 12 DIFFERENT TRANSDUCERS
Thomas L. Lewis and Jules B. Dods, Jr. Washington Oct. 1972 50 p refs
(NASA-TN-D-7087; H-700) Avail: NTIS HC $3.00 CSCL 14B

The turbulent boundary layer on the wall of a 9 by 7 foot wind tunnel was measured with 12 different transducers at Mach numbers of 1.6, 2.0, and 2.5. The results indicated that the wall surface-pressure-fluctuation field was more homogeneous at a Mach number of 2.5 than at Mach numbers of 1.6 or 2.0. A comparison of power-spectral-density data at Mach 2.5 with a summary of similar data (Mach 0.1 to 3.45) showed good agreement. The measurement uncertainty was greatest when

frequencies were low and the surface-pressure-fluctuation field was homogeneous. The uncertainty at higher frequencies increased as the surface-pressure-fluctuation field became more inhomogeneous. Since transducer mounting effects and system noise levels were determined not to have contributed appreciably to measurement uncertainties, the result was attributed to an interaction between the surface-pressure-fluctuation field and the transducers. Corcos' correction for size effects improved the comparison between transducers at the high frequencies, but did not eliminate an apparent size effect at the lower frequencies.
Author

N72-33388# European Southern Observatory, Geneva (Switzerland).
AUXILIARY INSTRUMENTATION FOR LARGE TELESCOPES
Svend Laustsen, ed. and Anders Reiz, ed. Jun. 1972 539 p refs Partly in ENGLISH and partly in FRENCH Proc. of a Conf. held at Geneva, 2-5 May 1972 Prepared Jointly with CERN
Avail: NTIS HC $29.00

The papers are divided into several sections dealing with instrumentation developments at large observatories and telescope projects; grating spectrographs and spectrometers; interferometric spectrometers; electronographic photometry and special instrumentation. For individual titles, see N72-33389 through N72-33438.

N72-33389 California Univ., San Diego. Dept. of Physics.
REVIEW: SOME PROBLEMS IN EXTRAGALACTIC ASTRONOMY
E. Margaret Burbidge *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 9-19 refs (For availability see N72-33388 24-14)

Problems in extragalactic astronomy such as faintness of source, need for linear response and sky subtraction are reviewed. Two spectrographic systems, an image dissector super scanner and the Digicon (digital image tube) are described, together with results obtained with them. ESRO

N72-33390 California Inst. of Tech., Pasadena.
HIGH RESOLUTION ASTRONOMICAL SPECTROSCOPY: ITS FUTURE
G. Muench *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 21-33 refs (For availability see N72-33388 24-14)

Advances in astronomical spectroscopy are reviewed commencing with Coude spectroscopy. Types of grating spectrographs are described as well as Fabry-Perot interferometers and their performance in measuring absorption lines. High dispersion requirements and limits are discussed and a proposal is put forward for a Coude laboratory. ESRO

N72-33391 Kitt Peak National Observatory, Tucson, Ariz.
INSTRUMENTATION FOR THE KPNO AND CTIO 4 METER REFLECTORS
Arthur A. Hoag *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 39-53 refs (For availability see N72-33388 24-14)

The instruments for the KPNO and CTIO 4 meter reflecting telescopes as related to the prime, Ritchey Chretien and Coude focal positions are described. These include correctors, cameras, rotator-adaptor and guider, spectrographs and spectrometers. Associated projects such as photography and computers are also considered. ESRO

N72-33392 Texas Univ., Austin. Dept. of Astronomy.
INSTRUMENTATION AND SOME PRINCIPAL PROGRAMS OF THE MCDONALD OBSERVATORY 2.75 METER (107 INCH) REFLECTOR
Harlan J. Smith *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 55-64 (For availability see N72-33388 24-14)

General design parameters relevant to large telescope instrumentation are discussed with particular reference to provision for multiple instruments, at a given focus, with ample space; rapid change between focal positions and daytime utilization. The Coude and Cassegrain instrumentation used with the McDonald 107 inch reflecting telescope is described with emphasis on the ruby laser for lunar ranging, Coude spectrograph, Coude scanner and interferometers. Present research utilization of the telescope and plans for future instrumentation are also reviewed. ESRO

N72-33393 Mount Stromlo Observatory, Canberra, (Australia).
BASIC INSTRUMENTATION FOR THE ANGLO-AUSTRALIAN TELESCOPE
S. C. B. Gascoigne and H. Wehner (Anglo-Australian Telescope Proj. Office) *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 65-73 (For availability see N72-33388 24-14)

Instruments permitting the use of the Anglo-Australian telescope at all three foci (prime, Cassegrain, Coude) are described. These include acquisition and guiding instruments, photometers, spectrometers, and gratings. ESRO

N72-33394 European Southern Observatory, Geneva (Switzerland). Telescope Project Div.
INSTRUMENTATION PLANNING FOR THE ESO 3.6 m TELESCOPE
A. Reiz *In its* Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 75-81 (For availability see N72-33388 24-14)

Instrumentation for the ESO 3.6 m telescope is considered in light of current and future observational requirements. Among the instruments considered are spectrometers, photometers, spectrophotometers and image tubes. ESRO

N72-33395 Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
PRESENT STATE OF THE MPIA PROJECT AND INSTRUMENTATION
H. Elsaesser *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 83-89 refs (For availability see N72-33388 24-14)

Progress on MPIA plans to establish a Northern Hemisphere observatory in Spain and a Southern Hemisphere observatory in S.W. Africa is reported. The viewing conditions at the proposed S.W. Africa site are compared to those in Chile and the telescopes (1.2, 2.2, and 3.5 m) and spectrographs described.
ESRO

N72-33396 Institut National d'Astronomie et de Geophysique, Meudon (France).
PLANNING THE INSTRUMENTATION FOR THE 3.60 m INAG TELESCOPE [PROJETS D'INSTRUMENTATION POUR LE TELESCOPE DE 3,60 m DE L'I.N.A.G.]
R. Cayrel *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 91-93 refs In FRENCH (For availability see N72-33388 24-14)

The theoretical principles governing the selection of the auxiliary optical instrumentation for use in connection with the 3.60 m INAG astronomical telescope for stellar spectrophotometry are presented. A 10 cm photocathode magnetic camera spectrograph, an image slicer to be used with holographic gratings for resolution above 20,000, and an infrared photometer are under study. ESRO

N72-33397 Observatoire de Marseille (France).
LUMINOSITY AND RESOLUTION OF SLIT SPECTROGRAPHS [LUMINOSITE ET EFFICACITE DES SPECTROGRAPHS A FENTE]
C. Fehrenbach *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 99-109 In FRENCH (For availability see N72-33388 24-14)

The limit magnitude and resolution of slit spectrometers to be used with astronomical telescopes were calculated. Certain parameters such as the dispersion, grating height, and transparency were studied in order to select the most appropriate equipment. A Cassegrain spectrometer with 10 cm grating collimator and a 1/4 F lens is proposed for small dispersions, a Coude spectrometer for 32 A/mm dispersion, and a Baranne mounting spectrometer for 16 A/mm, for use with the ESO 3.60 m telescope. ESRO

N72-33398 Royal Greenwich Observatory, Herstmonceux (England).
INTERMEDIATE DISPERSION CASSEGRAIN SPECTROGRAPH FOR THE AAT
D. R. Palmer and J. W. Gietzen *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 111-117 (For availability see N72-33388 24-14)

A description is given of a spectrograph for use at the Cassegrain focus of the AAT to cover a resolution range of 1320-4000. The optical solution and implementation are discussed and the mechanical arrangements and components described with emphasis on the slit area and remote control of mechanisms. ESRO

N72-33399 Beloit Coll., Wis. Thompson Observatory.
ECHELLE SPECTROGRAPHS
D. J. Schroeder *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 119-130 refs (For availability see N72-33388 24-14)

The features of echelle spectrographs are discussed and characteristics (angular dispersion, cross-dispersion, blaze) of echelle gratings considered. Spectrograph designs such as the modified Czerny-Turner arrangement and fast echelle spectrograph are described as well as other camera arrangements. ESRO

N72-33400 Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
ECHELLE GRATING SPECTROGRAPHS FOR THE CASSEGRAIN FOCUS OF THE AAT
R. C. M. Learner *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 131-140 refs (For availability see N72-33388 24-14)

The two echelle grating spectrographs (UV and IR) described are prototypes of instruments for the Cassegrain focus of the 3.8 m AAT and 2.5 m INT telescopes. The specification criteria for wavelength, resolving power, and image tube detection are summarized and subsidiary requirements such as separation between adjacent cross-dispersed echelles, collimator angle, and image quality discussed. ESRO

N72-33401 Imperial Coll. of Science and Technology, London (England). Applied Optics Section.
SPECTROGRAPHIC CAMERAS OF THE MAKSUTOV AND RELATED TYPES
C. G. Wynne *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 141-148 (For availability see N72-33388 24-14)

The design of spectrographic cameras derived from the Maksutov concept of a spherical surfaced meniscus lens so shaped as to be self-achromatic is described. The different characteristics of Schmidt and Maksutov cameras are discussed with particular emphasis on aberrations. ESRO

N72-33402 Zeiss (Carl), Oberkochen (West Germany).
A NEW CASSEGRAIN GRATING SPECTROGRAPH. PART 1: OPTICAL DESIGN
R. N. Wilson and A. Opitz *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 149-155 refs (For availability see N72-33388 24-14)

The optical design of a Cassegrain grating spectrograph developed for use with the 1 m reflector of the Hamburg Observatory is discussed. Long and short cameras with gratings of 300 and 600 L/mm are described. The final design uses three aspheric surfaces in the cameras and avoids the necessity of very steep menisci. ESRO

N72-33403 Zeiss (Carl), Oberkochen (West Germany).
A NEW CASSEGRAIN GRATING SPECTROGRAPH
R. Schlegelmilch *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 157-163 (For availability see N72-33388 24-14)

The mechanical design and operation of the Cassegrain grating spectrograph for the 1 m reflector at the Hamburg Observatory is described. The detailed construction of the slit assembly is explained with reference to its optical elements, mirrors, and illumination. ESRO

N72-33404 European Southern Observatory, Santiago (Chile).
A COMPUTER-CONTROLLED DIGITAL SPECTRUM SCANNER FOR LA SILLA
H. John Wood *In its* Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 165-168 (For availability see N72-33388 24-14)

A computer-controlled digital spectrum scanner designed for use at the Nasmyth focus of the 1 m ESO photometric telescope is described. The scanner, which provides a rapid precise changeover from the Cassegrain to the Nasmyth focus, will be usable on non-photometric nights and has several modes of operations. ESRO

N72-33405 Cambridge Univ. (England). Cambridge Observatories.
PHOTOELECTRIC DETERMINATION OF STELLAR RADIAL VELOCITIES
R. F. Griffin *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 171-173 (For availability see N72-33388 24-14)

The advantages offered by the photoelectric method of measuring stellar radial velocities over the conventional technique are stated and observations with the method briefly described. ESRO

N72-33406 Leiden Univ. Observatory (Netherlands). Southern Station.
SOME FEATURES OF THE LEIDEN RADIAL VELOCITY INSTRUMENT
T. Walraven and J. H. Walraven *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 175-183 (For availability see N72-33388 24-14)

The theory behind an instrument for measuring radial velocities by displacement of a slotted plate on which the spectrum is projected is discussed. The optical design of the spectrograph is described in detail with emphasis on the slot plate and detector. The instrument was designed to be mounted at the Cassegrain focus of a telescope. ESRO

N72-33407 Kapteyn Astronomical Lab., Groningen (Netherlands).
PHOTOELECTRIC DETERMINATION OF RADIAL VELOCITIES
L. Karsten *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 185-192 (For availability see N72-33388 24-14)

Several techniques for the measurement of stellar radial velocities are reviewed. The optics and electronics of the spectrophotometer at Roden are described and improvements relating to slit widths, resolving power, dispersion, and photomultipliers suggested. ESRO

N72-33408 Bausch and Lomb, Inc., Rochester, N.Y.
DIFFRACTION GRATINGS FOR LARGE TELESCOPES
Erwin G. Loewen *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes p 193-202 refs (For availability see

N72-33388 24-14)

A review is given of the advances made in echelle and Coude gratings. The advantages of echielles are considered and their ruling described. Replicas are also taken into account. Large gratings for Coude spectrographs are discussed with particular regard to the problem of grooving. ESRO

N72-33409 Jobin et Yvon S. A., Arcueil (France).
HOLO-GRATINGS AND SPECTROGRAPH DESIGN
A. Labeyrie (Paris Obs.), J. Flamand, and G. Pieuchard *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 203-208 refs (For availability see N72-33388 24-14)

The use of holographic gratings for improving performance in spectrographs is discussed with emphasis on luminosity and the development of concave stigmatic gratings. A spectrum slicer spectrograph is also briefly described. ESRO

N72-33410 Universitaets-Sternwarte Goettingen (West Germany).
STELLAR SPECTROSCOPY WITH HOLOGRAPHIC GRATINGS
G. Schmahl and D. Rudolph *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 209-215 refs (For availability see N72-33388 24-14)

A description is given of plane reflection holographic gratings for use in the visible region. The results obtained with a ruled width of 100 mm are discussed. ESRO

N72-33411 Recherches et Etudes d'Optique et de Sciences Connexes, Ballainvilliers (France).
GRATING MOSAICS [MOSAIQUE DE RESEAUX]
A. Bayle and J. Espiard *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 217-222 In FRENCH (For availability see N72-33388 24-14)

A model for achieving parallelism of mosaic surfaces and using mosaic replicas (cost saving) is described. A mosaic of 2 cm engraving height is necessary to achieve better luminosity and therefore better performance of astronomical telescope spectrometers. Two techniques for surface polishing and the optical and opto-mechanical procedures are presented. ESRO

N72-33412 Observatoire de Marseille (France).
SPECTROGRAPHIC EQUIPMENT FOR THE COUDE FOCUS OF A 3.60 m TELESCOPE. FEASIBILITY STUDY OF A UNIVERSAL SPECTROGRAPH [EQUIPMENT SPECTROGRAPHIQUE DU FOYER COUDE DU TELESCOPE DE 3.60 METRES. ETUDE DE LA FAISABILITIE D'UN SPECTROGRAPHE UNIVERSEL]
A. Baranne *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 227-239 refs In FRENCH (For availability see N72-33388 24-14)

Two types of spectrographic equipment to be used at the Coude focus of a 3.60 m astronomical telescope are described. They include the standard mounting and the echelette grating mounting. Advantages and disadvantages of both mountings are presented. ESRO

N72-33413 Observatoire de Marseille (France).
ECHEL.E.C. 152 COUDE SPECTROGRAPH. (MOUNTING WITH WHITE SHUTTERS FOR ELECTRONIC CAMERA) [LE SPECTROGRAPH COUDE ECHEL.E.C. 152 (MONTAGE A PUPILLE BLANCHE POUR CAMERA ELECTRONIQUE)]
A. Baranne and M. Duchesne (Paris Obs.) *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 241-245 refs In FRENCH (For availability see N72-33388 24-14)

The echelEC spectrometer for the Coude focus of a 1.52 m diameter spectrometer to be used with the ESO astronomical telescope is described. The resolution obtained using echelette and echelle gratings are presented. Different image receiver characteristics are given. Finally the adaptation of an electronic camera to the echelEC 1.52 is considered. ESRO

N72-33414 Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
DESIGN STUDY OF THE COUDE SPECTROGRAPHS FOR THE 2.2 m TELESCOPES OF THE MPI FOR ASTRONOMY
K. Bahner and J. Solf *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 247-257 (For availability see N72-33388 24-14)

The design of a conventional grating spectrograph for use at the Coude focus of the two MPI 2.2 m Ritchey-Chretien telescopes is discussed. The general principles of the spectrograph are outlined and some telescope and building parameters are given. The elements of the spectrograph are detailed as well as its framework construction and calibration. ESRO

N72-33415* McDonald Observatory, Austin, Tex.
THE COUDE SPECTROGRAPH AND ECHELLE SCANNER OF THE 2.7 m TELESCOPE AT MCDONALD OBSERVATORY
Robert G. Tull *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 259-274 refs (For availability see N72-33388 24-14)
(Contract NASr-242; Grant NSR-44-012-152)
CSCL 14B

The design of the Coude spectrograph of the 2.7 m McDonald telescope is discussed. A description is given of the Coude scanner which uses the spectrograph optics, the configuration of the large echelle and the computer scanner control and data systems. ESRO

N72-33416 Dominion Astrophysical Observatory, Victoria (British Columbia).
IMAGE SLICERS FOR IMAGE TUBE SPECTROGRAPHS
E. H. Richardson *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 275-284 refs (For availability see N72-33388 24-14)

The use of image slicers in conjunction with fast image tube spectrographs at the 72-inch Victoria telescope is discussed. The optical specifications of the image slicers are tabled, and the concentric-mirror spectrograph is described together with the effective entrance aperture. It is concluded that the use of such image slicers avoids loss of light caused by central obscuration in the spectrograph and also increases the width of the entrance aperture on the sky. ESRO

N72-33417 Dominion Astrophysical Observatory, Victoria (British Columbia).
THE COUDE OF THE 1.2 METER TELESCOPE AT VICTORIA
E. H. Richardson *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 285-290 refs (For availability see N72-33388 24-14)

A description is given of the 1.2 m Victoria telescope which uses small Coude secondary mirrors and flats in turrets of three mirrors each; the mirrors having high reflectance coatings for different spectral regions. The spectrographs have no corrector lenses and superpositioning-type image slicers are used except for wide-slit work. ESRO

N72-33418 European Preparatory Commission for Space Research, Paris (France).
A CROSSED FIELD FAST SCANNING IMAGE DISSECTOR
C. D. Johnson and V. A. Stanley (EMI Electron. Ltd.) *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 291-294 refs (For availability see N72-33388 24-14)

The development of a device for fast optical image dissection in which the beam scanning is achieved by crossed electric and magnetic fields is described. Variation of the electric field configuration alone provides the scanning mechanism, while high spatial resolution is ensured by the guidance of photoelectrons

along epitrochoid trajectories which result from the combined fields. ESRO

N72-33419 University Coll., London (England). Dept. of Physics.
PERFORMANCE OF THE UCL IMAGE PHOTON COUNTING SYSTEM
A. Boksenberg *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 295-316 refs (For availability see N72-33388 24-14)

The problem of detecting and recording an optical image is one of counting the number of photons in each image element. A technique is described in which the photoelectron scintillations exhibited by a high-gain cascade image intensifier are selected by means of a continuously scanning television camera acting as both sensor and one-frame buffer store and on-line to a small computer. The advantages of the system and results of performance relating to detection of photon events, signal to noise ratio, and resolution are given and future applications discussed. ESRO

N72-33420 Princeton Univ. Observatory, N.J.
AN INTEGRATING TELEVISION SYSTEM FOR ASTRONOMY
Donald C. Morton *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 317-331 refs (For availability see N72-33388 24-14)

Sensors that can record two-dimensional pictures with the efficiency of photocathodes while retaining the integrating properties of photographic plates are required for astronomical television systems. The essential features of such a sensor, the SEC vidicon tube, are described and its use in integrating television emphasized. Applications such as observing and the resolving of the narrow absorption lines in the PHL 957 spectrum with the SEC vidicon are discussed. The data reduction steps are outlined, costs detailed, and observational programs such as spectra of quasars and galaxies are considered. System problems and future developments are also mentioned. ESRO

N72-33421 Imperial Coll. of Science and Technology, London (England). Dept. of Astronomy.
A PHOTOELECTRON-COUNTING SPECTROPHOTOMETER
R. W. Airey, F. C. Delori, J. D. McGee, and B. L. Morgan *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 333-343 refs (For availability see N72-33388 24-14)

A photoelectron counting system which combines an image intensifier with an image dissector is described. It is designed to give digital recording of stellar spectra having at least 512 information elements in each of sky and star plus sky channels. The performance of the system relating to resolution, choice of dwell time, effect of scintillation amplitude distribution, and dynamic range is discussed and experimental tests are outlined. ESRO

N72-33422 Conservatoire National des Arts et Metiers, Paris (France). Inst. National de Metrologie.
HIGH RESOLUTION INSTRUMENTATION AT FOCUS OF LARGE TELESCOPES [LES APPAREILS DE HAUTE RESOLUTION AU FOYER DES GRANDS TELESCOPES]
P. Bouchareine *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 349-356 refs In FRENCH (For availability see N72-33388 24-14)

Characteristics and performance of different spectroscopic devices to be used at foci of large astronomical telescopes are compared. They include prisms, interference gratings, Fabry-Perot interferometers, photographic emulsions and photocathodes, and Fourier transform interferometry. ESRO

N72-33423 Imperial Coll. of Science and Technology, London (England).
HIGH RESOLUTION MICHELSON INTERFEROMETRY IN THE VISIBLE
J. Ring, C. L. Stephens, and R. C. Wayte *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 357-365 refs Sponsored by Sci. Res. Council (For availability see N72-33388 24-14)

A high resolution interferometer for use in the visible spectrum at the Coude focus of the Isaac Newton telescope was designed and partly manufactured. The astronomical case is discussed, observational feasibility is shown, and practical design features outlined. ESRO

N72-33424 Kitt Peak National Observatory, Tucson, Ariz.
A HIGH PRECISION FOURIER SPECTROMETER FOR THE VISIBLE
J. Brault *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 367-373 refs (For availability see N72-33388 24-14)

The advantages of Fourier spectrometers for use in the visible spectrum are discussed and design specifications for solar applications are considered. The spectrometer is described as well as the data handling system. The Fourier spectrometer is expected to give an information flow up to 4000 times faster than double-pass grating spectrometers. ESRO

N72-33425 Observatoire de Marseille (France).
LONG SLIT SPECTROMETERS (FOCAL REDUCERS, FABRY-PEROT SPECTROMETERS, GRATING SPECTROMETERS) [SPECTROGRAPHS A FENTE LONGUE (REDUCTEURS FOCAUX, SPECTROGRAPHES PEROT-FABRY, SPECTROGRAPHIES A RESEAU)]
G. Monnet *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 375-387 refs In FRENCH (For availability see N72-33388 24-14)

Different means for achieving high optical performance of large astronomical telescopes such as focal reducers, lens frames, multislit spectrometers, Fabry-Perot spectrometers, combined grating/Fabry-Perot mountings, and image tubes are presented. Different mounting systems are discussed. Advantages of all systems are compared and the spectral resolution considered. ESRO

N72-33426 Paris Observatory, Meudon (France).
SPECKLE INTERFEROMETER FOR 0.02 sec STELLAR RESOLUTION
A. Laberie *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 389-393 refs (For availability see N72-33388 24-14)

In the presence of atmospheric inhomogeneities and telescope aberrations which increase the image size, diffraction-limited resolution can be retrieved using special observing techniques. The technique described utilizes full aperture and depends on coherent optical processing techniques for data reduction. The system records stellar images in which speckle granulation caused by atmospheric inhomogeneities is present. The fine structure of random interference granules carries high resolution information about a stellar object. The information is extracted using Fourier analysis. ESRO

N72-33427 Lick Observatory, Mount Hamilton, Calif.
THE APPLICATION OF ELECTRONOGRAPHY IN ASTRONOMICAL PHOTOMETRY
Merle F. Walker *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 399-419 refs (For availability see N72-33388 24-14)

The application of electronography to astronomical photometry, its advantages and the impact that the utilization of electronographic-type detectors may have on the design of future telescopes and auxiliary instruments are discussed. ESRO

N72-33428 Paris Observatory, Meudon (France).
PHOTOMETRY OF FAINT STARS USING ELECTRONOGRAPHY [PHOTOMETRIE D'ASTRES TRES FAIBLES PAR

ELECTRONOGRAPHIE]
Gerard Wlerick *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 421-431 refs In FRENCH (For availability see N72-33388 24-14)

The advantages of using electronography or electron photomultiplier photometry for stellar observations are compared. Performance of the Haute Provence Observatory telescope during observation of radio source 3C 173 and of the Mount Palomar Observatory telescope during observation of faint stars such as the M 15 star cluster is discussed. ESRO

N72-33429 Royal Greenwich Observatory, Herstmonceux (England).
ELECTRONOGRAPHIC IMAGE TUBES FOR STELLAR FIELD PHOTOMETRY
D. McMullan *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 433-443 refs (For availability see N72-33388 24-14)

Electronographic tubes are reviewed and features essential for their design itemized. The features, especially the mica window, inherent in tubes designed by the Royal Greenwich Observatory, are outlined, and the application of such tubes to direct electronography is discussed. A proposed 80 mm electronographic camera for INT focus is described. ESRO

N72-33430 Paris Observatory, Meudon (France).
SPECTROMETERS AND ELECTRONOGRAPHY [LES SPECTROGRAPHS ET L'ELECTRONOGRAPHIE]
M. Combes, P. Felenbok, J. P. Picat, B. Fort, and R. Cayrel *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 445-453 refs In FRENCH (For availability see N72-33388 24-14)

The advantages and disadvantages of the electronographic image receiver for ultraviolet stellar spectrophotometry applications are discussed. The comparison of different optical system performances led to the selection of the Carruthers superconducting electromagnetic camera on whose principle the large astronomical telescope spectrometer camera is to be based. ESRO

N72-33431 Zeiss (Carl), Oberkochen (West Germany).
PHOTOGRAPHIC ATTACHMENT TYPES 24 AND 30
C. Kohne *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 457-462 refs (For availability see N72-33388 24-14)

Photographic attachments for use with astronomical telescopes are discussed. The design of the various elements such as body, photoplate, offset pickup, drives, and slide is described. ESRO

N72-33432 Leiden Univ. Observatory (Netherlands).
ACHROMATIC POLARIZATION MODULATORS FOR MULTICHANNEL POLARIMETERS
J. Tinbergen *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 463-471 refs (For availability see N72-33388 24-14)

In order to overcome scintillation in the measurement of polarization, a modulator is required. If the polarimeter is a multichannel instrument, the modulator must be achromatic, since the polarization must be subjected to stable intensity modulation before the light is split into its constituent wavelengths. The feasibility of achromatic polarization modulators is discussed for both linear and circular polarization. ESRO

N72-33433 Padua Univ. (Italy). Asiago Astrophysical Observatory.
THE IMAGE TUBE NEBULAR SPECTROGRAPH OF THE ASIAGO OBSERVATORY
F. Bertola *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 473-475 (For availability see N72-33388 24-14)

The components and characteristics of a spectrograph, designed primarily for the study of galaxies and galactic nebulae at the f/5 Newtonian focus of the 122 cm reflector at Asiago, Italy, are described. ESRO

N72-33434 Geneva Observatory (Switzerland).
REALIZATION OF AN AUTOMATIC GUIDING SYSTEM
J.-L. Poncet and P. Bartholdi *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 479-483 (For availability see N72-33388 24-14)

The essential part of an automatic guiding system is the position detector which determines the position of the image relative to a fixed reference by means of illumination distribution. The conditions to be satisfied by the detector are outlined, and the principles of operation and performance of such a detector are discussed. ESRO

N72-33435 Dilworth, Secord, Meagher and Associates, Ltd., Toronto (Ontario).
OBSERVER'S FACILITIES AT THE CASSEGRAIN FOCUS
John C. Farrell *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 485-491 (For availability see N72-33388 24-14)

The methods developed for supporting the observer at the Cassegrain focus of large telescopes are reviewed, and the requirements and priorities that the designer considers are identified. The development of a universal chair which provides full access is described. ESRO

N72-33436 St. Andrews Univ. (Scotland). Univ. Observatory.
A PROPOSED STANDARD MECHANICAL INTERFACE FOR CASSEGRAIN ACQUISITION-GUIDER HEADS
I. G. VanBreda and P. W. Hill *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 493-498 refs (For availability see N72-33388 24-14)

A proposal is put forward for an international standard for the interface between Cassegrain acquisition guider heads and auxiliary equipment. The proposal concerns the accessibility of focus and the sizes and layout of bolt fixing holes. ESRO

N72-33437 Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
THE USE OF CAMAC FOR TELESCOPE INSTRUMENTATION
C. L. Stephens and I. G. VanBreda (St. Andrews Univ.) *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 499-514 refs (For availability see N72-33388 24-14)

The hardware and software aspects which must be considered when setting up a standard interface between a computer and telescope instrumentation are discussed in relation to the CAMAC modular instrumentation system for data handling. Three instruments (photoelectric photometer, Michelson interferometer, and multichannel spectrometer) are described in terms of their CAMAC requirements. ESRO

N72-33438 Copenhagen Univ. (Denmark). Univ. Observatory.
[SUMMARY AND CONCLUDING REMARKS]
B. Stroemgren *In* ESO/CERN Auxiliary Instrumentation for Large Telescopes Jun. 1972 p 515-525 (For availability see N72-33388 24-14)

A summary is given of development, problems, and techniques in the areas of slits, collimators, dispersing element, cameras, detectors, gratings and spectral analysis, in relation to astronomical spectrophotometry. ESRO

N72-33439# Sandia Labs., Albuquerque, N.Mex.
OPTICAL ANALYSIS OF AN UNDERWATER RADIOMETER SYSTEM
R. L. Hughes May 1972 24 p refs Sponsored by AEC

(SC-DR-710619) Avail: NTIS

An existing underwater radiometer system was investigated for use outside its original design limits. By means of a lens analysis computer program, the effect of object distance and condition of use on the optical transmission of the system was determined. A discrepancy between design acceptance angles and experimental results is explained by defocus effects at close-object distances. Author

N72-33440# Addis Translations International, Woodside, Calif.
IMAGE CONVERTER SUITABLE FOR OBSERVING LUMINOUS EVENTS WITH TIME SCALES OF THE ORDER OF 10 TO THE MINUS 11TH POWER SECONDS
R. Marchetti and E. Penco Apr. 1972 14 p refs Transl. into ENGLISH from Alta Freq. (Milan), v. 40, no. 3, 1971 p 256-259 Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab. Sponsored by AEC
(UCRL-Trans-10613) Avail: NTIS

A high-speed image converter was developed for use in the streak-mode with 1 centimeter per nanosecond tracing speed. The resolution time was determined by using, as the light source, a semiconductor laser synchronized with the scanning signal applied to the converter. Some results of measurements carried out on pulsed light sources are shown. Author

N72-33441# Vanderbilt Univ., Nashville, Tenn.
EVALUATION OF LITHIUM-DRIFTED GERMANIUM DETECTORS FOR ORGAN SCANNING
J. J. Patton, A. B. Brill, R. Rolfes, and R. E. Johnston [1971] 19 p Presented at 18th Ann. Meeting of Soc. of Nucl. Med., Los Angeles, 28 Jun. - 2 Jul. 1971
(Contract AT(40-1)-2401)
(ORO-2401-49; Conf-710605-1) Avail: NTIS

Results of a study on the performance of Ge(Li) detectors for radioisotope scanning are given and discussed. The spatial resolution and sensitivity of Ge(Li) detectors and NaI scintillation detectors are compared. NSA

N72-33442# Atomic Energy of Canada Ltd., Chalk River (Ontario). Nuclear Labs.
AN I SUB O SUBTRACTION UNIT FOR USE WITH PULSED OR dc LIGHT SOURCES IN KINETIC SPECTROPHOTOMETRY
E. B. Selkirk and W. A. Seddon Feb. 1972 8 p refs
(AECL-4134) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $0.50

Pulsed xenon arc light sources are commonly used to increase the analyzing light intensity, I sub o, for kinetic spectrophotometry in pulse radiolysis experiments. A circuit is described which automatically subtracts the I sub o level, and when used in conjunction with a dual beam oscilloscope (Tektronix 556), allows the pulsed light profile, I sub o, and transient signal to be recorded simultaneously. The unit can also be used with dc light sources, photomultipliers, photodiodes and photo voltaic devices without modification. Author (NSA)

N72-33443# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.
PROCESSING OF SPECTRA FROM SEMICONDUCTOR DETECTORS BY SEMIAUTOMATIC SYSTEM CONTAINING STORAGE AND COMPUTERS
R. Arlt, G. Winter, S. V. Medved, G. Musiol, A. N. Sinaev, Z. A. Usmanova, D. Fromm, N. A. Chistov, and H. Strusny Feb. 1972 27 p refs In RUSSIAN
(JINR-P6-6227) Avail: AEC Depository Libraries

A semiautomatic system consisting of a computer and storage capability was designed for spectra processing from semiconductor detectors. Information from the spectrometric apparatus is recorded in monitoring-storage facilities, and at the conclusion of the exposure, is transmitted to a buffer installation. The latter is equipped with an oscillograph with a light pencil for control, lay-out, and selection of data for further processing. Preliminary processing of information is accomplished by means of a Minsk-22 computer, and final processing is handled in a CDC-1604A. Programs process data from gamma spectra, beta spectra, and spectra from conversion electrons. Author (NSA)

N72-33444# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Obninsk (USSR). Fiziko-Energeticheskii Inst.
GAMMA-SPECTROMETER OF HIGH RESOLUTION
A. F. Gamalii, A. I. Gonchar, Yu. V. Karyakin, B. V. Nesterov, and N. N. Shchadin 1971 11 p refs In RUSSIAN
(FEI-251) Avail: AEC Depository Libraries

A high-resolution semiconductor spectrometer is described, and the factors which effect its resolving power are discussed. The associated preamplifier and amplifier are shown in schematic form. Sample spectra from Co-57, Co-60, and an (n, gamma) reaction on Cr-53 are given. NSA

N72-33445# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Serpukhov (USSR). Inst. Fiziki Vysokikh Energii.
CALCULATION OF DISTORTIONS IN THE OPTICAL SYSTEMS OF BUBBLE CHAMBERS
S. V. Klimenko, O. I. Mikhailov, and A. M. Rybin 1970 26 p refs In RUSSIAN
(IFVE-SPK-70-110) Avail: AEC Depository Libraries

A system for taking pictures of a conventional bubble chamber for a general case in the form of a set of poles of conical projection and of a system of refractive surfaces is considered. A real system for taking pictures is considered as a distortion of some ideal system. A structure for transforming the coordinates of a space point image of the bubble chamber operational volume from real into ideal ones is described. Author (NSA)

N72-33446# Queen Mary Coll., London (England).
THE DESIGN OF HIGH SENSITIVITY PRESSURE TRANSDUCERS FOR USE IN SHOCK-TUNNELS
R. O. Goodchild and L. Bernstein Aeron. Res. Council 1972 85 p refs Supersedes ARC-31767
(ARC-CP-1219; ARC-31767) Avail: NTIS HC $6.25; HMSO £1.35; PHI $5.30

The theory of piezoelectricity in so far as it relates to pressure sensing elements in briefly outlined and various configurations are compared. The relative merits of charge and voltage amplifiers are discussed and a practical charge amplifier and charge calibrator are described. Both acoustic and electronic filters are considered and the extent to which a filter affects the useful rise-time of a transducer is emphasised. Several prototype transducers using sensing elements in compression, shear or bending were built and calibrated. A sensitivity of 48.9 pC/torr was achieved using a PZT bimorph disc in bending, this transducer having a natural frequency of 10 kHz. Environmental tests in a shock tube and in the hypersonic nozzle of a shock tunnel are also described. Some brief comparisons with commercial transducers are made. Author (ESRO)

N72-33447# International Research and Development Co., Ltd., Newcastle (England).
DEVELOPMENT OF THERMISTOR BOLOMETERS
R. J. Mytton and R. K. Benton Paris ESRO May 1972 133 p refs
(Contract ESTEC-808/69)
(ESRO-CR-50) Avail: NTIS HC $8.75

Two types of ceramic active elements were considered for the bolometer: one consists of a mixture of Mn and Ni oxides and has a large negative temperature coefficient (NTC) of resistance, and the other consists of lanthanum-doped barium strontium titanate and has a large positive temperature coefficient (PTC) of resistance. The PTC material is shown to have several potential advantages over the NTC material, including a larger temperature coefficient, a lower resistivity, etc. The sensitivity of the PTC to voltage was minimized by reducing grain size. Techniques were established for production of 10 micrometer

thick flakes. The noise in the material increases when the size of the flake is reduced. The noise is thought to be a property of semiconducting barium titanate. It is concluded that this material is fundamentally a noise semiconductor unsuitable for bolometer applications. Author (ESRO)

N72-33448# Officine Galileo S.p.A., Florence (Italy).
STUDY ON THE APPLICABILITY OF PYROELECTRIC DETECTORS TO IR FAN-BEAM SENSORS FOR A SPINNING GEOSTATIONARY SATELLITE OF THE GEOS TYPE
R. Fontana, G. DeVidi, and I. Varano Paris ESRO Jul. 1972 92 p
(Contract ESTEC-1334/71)
(ESRO-CR-83) Avail: NTIS HC $6.75

The applicability was analyzed of pyroelectric detectors for infrared fan beam sensors to be used in spinning satellites operating at geostationary altitude. It appears that a fan beam sensor using a circular parabolic mirror and a single detector with a sensitive element of 1.5 mm x 10 mm will give adequate signal to noise ratio for large fields of vision (120 deg x 1.5 deg). The optimization of the processing electronic parameters for two spin rates, 10 rpm and 120 rpm, the energy distribution on the detector as a function of different aspect angles, as well as the accuracy of the sensors are discussed in some detail.
Author (ESRO)

N72-33449# Royal Aircraft Establishment, Farnborough (England). Radio Dept.
FABRY-PEROT MODULATOR FOR SPACE USE
B. Ellis Paris ESRO Jul. 1972 72 p refs
(Contract ESTEC-1265/7-AA)
(ESRO-CR-88) Avail: NTIS HC $5.75

An experimental verification of earlier predictions shows that the Fabry-Perot modulator is a promising alternative to mechanical devices for space use. Performance data, both optical and electrical, are given for a variety of circumstances including temperatures over the range -20 to +70 C. With strongly covergent (f/1) radiation in the 14-16 micrometers band the measured effective modulation was 49 percent. Allowing for absorption and reflection losses this is expected to correspond to a figure of 37 percent in the fully operational state. Tests show that precisely parallel alignment is not essential and results are also presented for radiation which is obliquely incident.
Author (ESRO)

N72-33450# Royal Aircraft Establishment, Farnborough (England).
AN EXPERIMENTAL CANOPUS STAR SENSOR
P. Haskell Mar. 1972 32 p refs
(RAE-TR-71246; BR-28701) Avail: NTIS HC $3.75

The Canopus star sensor, developed for the technology satellite designated X4, due for launch in 1974, and its role in spacecraft stabilization, with respect to the sun and the star Canopus, is described. It forms part of a 3-axis attitude control system with a number of sensors, enabling the spacecraft to be attitude stabilized within the reference frame of celestial coordinates, defined by sun and stars. The modes of operation performed by the spacecraft to check the parameters of the sensor and enable subsidiary experiments to be carried out by the sensor during the mission are briefly described.
Author (ESRO)

N72-33451# Battelle Inst., Frankfurt am Main (West Germany).
DETERMINATION OF RELATIVE WEIGHT CHANGES OF ELECTROSTATICALLY SUSPENDED PARTICLES IN THE SUB MICROGRAMME RANGE
G. Boehme, E. Robens, H. Straubel, and G. Walter [1972] 13 p refs Presented at the 10th Conf. on Vacuum Tech., Uxbridge, Engl., 10-12 Jul. 1972 Submitted for publication
(Rept-317-49) Avail: NTIS HC $3.00

Weight variations of electrically charged particles with masses in the nano and picogram range were detected by suspending these particles electrostatically in the inhomogeneous alternating field of a three plate capacitor with center holes. The alternating field keeps the particles in a stable position in the borehole of the intermediate electrode. A constant field between the two outer electrodes can be applied to counterbalance the weight of the particles. Relative mass changes due to vapor sorption were determined from the onset of oscillation caused when the stabilizing ac voltage was raised. Weight changes of less than 1 picogram were observed. Experiments to determine whether the method can be used for gravimetric analysis of reaction kinetics between gases and solids are discussed.
Author (ESRO)

N72-33452# Hamburg Univ. (West Germany). 1. Inst. fuer Experimentalphysik.
TIME STRUCTURE INVESTIGATIONS OF CURRENT PULSES FROM SILICON SEMICONDUCTOR DETECTORS [UNTERSUCHUNGEN AN SILIZIUMHALBLEITERDETEKTOREN AUR ZEITLICHEN STRUKTUR DER STROMIMPULSE]
E. Fretwurst, N. Haken, G. Lindstroem, Mueller-Roos, and W. Oelert Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Aug. 1972 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-K-72-11) Avail: NTIS Zentralstelle fuer Atomkernenergie-Dokumentation (ZAED), Leopoldshafen, West Ger. 7,80 DM

Current pulses from silicon semiconductor detectors were investigated by means of a sampling oscilloscope and an averaging technique with a time resolution of 3 nsec. Several detectors were bombarded with alpha-particles as well as protons. Theoretical calculations of the current pulse shapes were performed and compared with experimental results as function of geometry, detector voltage, and temperature.
Author (ESRO)

N72-33453# Nucletron Gesellschaft fuer Nucleonic und Electronic m.b.H., Munich (West Germany). Entwicklungslab.
PHYSICAL AND TECHNICAL DATA CONCERNING THE MANUFACTURE OF MINIATURIZED SILICON SURFACE BARRIER LAYER DETECTORS FOR MEDICAL AND BIOLOGICAL APPLICATION Two Yearly Report, 1969/1970 [PHYSIKALISCH-TECHNISCHE DETAILS ZUR HERSTELLUNG MINIATURISIERTER SILIZIUMOBERFLAECHENSPERRSCHICHTDETEKTOREN FUER BIOLOGISCH-MEDIZINISCHE, ANWENDUNGSBEREICHE, BERICHTSZEITRAUM 1.1.1969-31.12.1970]
H. Pfeiff, H. Pfeiff, M. Allwein, G. Linhart, and R. Paugger Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Aug. 1972 45 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-K-72-12) Avail: NTIS HC 4.25; Zentralstelle fuer Atomkernenergie-Dokumentation (ZAED), Leopoldshafen, West Ger., 8,40 DM

Miniaturized surface-barrier semi-conductor detectors consisting of silicon cylinders are described and manufacturing details are presented. Physical properties and performance characteristics are discussed and examples given of applications such as measurements of the Am-241 alpha particle absorption and the P-32 beta absorption at different detector voltages and different temperatures. Author (ESRO)

N72-33454# European Space Research and Technology Center, Noordwijk (Netherlands). Testing Div.
SPECIFICATION FOR COPPER/CONSTANTAN THERMOCOUPLE WIRE TO BE USED FOR SPACECRAFT TEMPERATURE MEASUREMENT
Sep. 1971 11 p
(ESRO-PSS-10/THT-08-Issue-1) Avail: NTIS HC $3.00

A specification is given for copper/constantan thermocouple wire compatible with existing measuring equipment and techniques at ESTEC. The insulation required is suitable for use

during thermal-balance tests etc., in thermal vacuum chambers.
Author (ESRO)

N72-33455# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
PROJECT BEBLOKA. THE TRANSFORMATION OF POINTS FROM OVERLAPPING IMAGES OBTAINED WITH *DIFFERENT SENSORS INTO THE MAP SYSTEM* Final Report
E. R. Bosman, E. Clerici, D. Eckhart, and K. Kubik [1971] 8 p refs
Avail: NTIS HC $3.00

A program system used for simultaneous point rectification of partly overlapping images obtained with different sensors (conventional photogrammetry, side looking radar, and infrared line scan) is described. The problem is solved in two phases. In the first phase all image points to be rectified are transformed into a local ground coordinates system. In the second phase the incompleteness of the mathematical model assumed in the first phase is compensated for by using a set of reference points (control points) and the information given by all those points appearing simultaneously in more images (tie points).
Author (ESRO)

N72-33456# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft. Data Processing Div.
KARIN. A PROGRAMME SYSTEM FOR THE MAPPING OF REMOTE SENSING INFORMATION
E. R. Bosman, E. Clerici, D. Eckhart, and K. Kubik [1972] 18 p refs Presented at the 12th Congr. of the Intern. Soc. for Photogrammetry, Ottawa, 1972
Avail: NTIS HC $3.00

A system designed to transform points of side-looking radar and IR line scanner images into maps in described. In the method a block of images is related to the map coordinate system with the help of reference points. The theory of the system which uses a digital computer is outlined and applications are considered.
Author (ESRO)

N72-33457# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
A COMPUTER CONTROLLED PRECISION COMPARATOR-DENSITOMETER
P. W. H. Blansjaar, ed. [1972] 13 p refs Presented at the 12th Congr. of the Intern. Soc. for Photogrammetry, Ottawa, 1972
Avail: NTIS HC $3.00

The development and construction of a computer controlled machine which automatically measures densities of photographic plates or films is described. The points of the plate to be measured are specified by computer program and it is possible to compute the next point to be measured based on preceding data. The uses of the machine envisaged are high precision measurements of plates and selection measurements of remote sensing images on film.
Author (ESRO)

N72-33458# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
ELECTRONIC IMAGE ENHANCEMENT IN REMOTE SENSING
P. J. F. Geerders [1971] 14 p refs Presented at the 12th Congr. of the Intern. Soc. for Photogrammetry, Ottawa, 1972
Avail: NTIS HC $3.00

The necessity to have the information content of pictures obtained by remote sensing techniques reduced before being read into the computer and the possiblity of doing this visually (human) is considered. A television technique is described which gives optimum image enhancement by taking into account the relationship between brightness shades, adding contours, and converting black and white to color.
Author (ESRO)

N72-33459# Rijkswaterstaat, The Hague (Netherlands). Data Processing Dept.
ISP INVESTIGATION INTO THE ACCURACY OF *PHOTOGRAMMETRIC TRIANGULATION* Intermediate Report
K. Kubik and J. Kure, (Intern. Inst. for Aerial Survey and Earth Sci.) Aug. 1971 26 p refs Sponsored by Neth. Interdept. Working Group on the Appl. of Remote Sensing
Avail: NTIS HC $3.50

The current situation regarding the acquisition of the accuracy data of photogrammetric triangulation, in order to allow its complete analysis and to predict the accuracy in the minor contact points and different systems of aerial triangulation, is summarized.
Author (ESRO)

N72-33460# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft. Data Processing Dept.
COORDINATE ERRORS IN STRIPS AND BLOCKS DUE *TO SYSTEMATIC IMAGE ERRORS*
K. Kubik Aug. 1971 34 p refs Sponsored by Neth. Interdept. Working Group on the Appl. of Remote Sensing
Avail: NTIS HC $3.75

The results of an investigation into the effects of systematic image deformations in bundle adjustment are presented. The hypothesis that systematic image errors have an effect significantly different from random image errors is substantiated by the present findings.
Author (ESRO)

N72-33461# Rijkswaterstaat, The Hague (Netherlands). Data Processing Div.
ANALYSIS OF THE EFFECTS OF SYSTEMATIC IMAGE ERRORS IN BLOCK TRIANGULATION
D. Eckhart and K. Kubik 1971 38 p refs Sponsored by Neth. Interdept. Working Group on the Appl. of Remote Sensing
Avail: NTIS HC $4.00

The dependency of the effects of systematic image errors upon various photogrammetric block parameters are studied by means of statistical analysis. The principle measures of the error effects are outlined and the results of the analysis detailed.
Author (ESRO)

N72-33462# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PERFECTED MODEL OF A UNIVERSAL SPECTROMETER FOR RESEARCH ON THE FIELD OF SHORT-WAVE EMISISON IN THE ATMOSPHERE
V. V. Mikhailov and V. P. Voitov 10 Mar. 1972 14 p refs Transl. into ENGLISH from Probl. Fiz. Atmosfery (USSR), 1969 p 175-181
(AD-745240; FTD-MT-24-1199-71) Avail: NTIS CSCL 04/1

A description is given of a perfected model of a universal spectrometer intended for studying the field of short-wave emission in the atmosphere. In contrast to the previous model in which the brightness of sky is measured without allowance for polarization of the emission, and the fluxes of direct solar radiation are measured only from the center section of the solar disc, in the perfected model three new attachments have been introduced, one of which allows measurement of the brightness of the sky and the state of polarization of stray radiation, the second allows measurement of the brightness of the sky through a depolarizer, and the third allows measurement of the flows of direct solar radiation from the entire solar disc with a 2 degrees angle of view.
Author (GRA)

N72-33463# Lincoln Lab., Mass. Inst. of Tech., Lexington.
STRAIN GAGE INSTRUMENTATION OF A BUOYANT CABLE
Ogden G. Nackoney 30 Mar. 1972 38 p refs
(Contract F19628-70-C-0230; AF Proj. 1508)
(AD-744825; ESD-TR-72-80; TN-1972-18) Avail: NTIS CSCL 09/5

The strain gage instrumentation of a buoyant cable used for

submarine ELF receiving antennas is presented. Techniques were developed to bond the strain gage reliably to the polyethylene cable jacket and to seal the jacket using an injection molding process. The design of a low noise strain gage amplifier for dynamic strain measurements is discussed, and the general problem of measuring strain at a remote point is considered. Author (GRA)

N72-33464# State Univ. of New York, Buffalo. High Pressure Lab.
ENGINEERING EVALUATION STUDY OF ENVIRONMENTAL CONDITIONING SYSTEMS FOR HIGH PRESSURE RESEARCH VESSELS Final Report, 1 Feb. - 31 May 1972
John M. Canty, Edward H. Lanphier, and Richard A. Morin 28 Jun. 1972 80 p refs
(Contract N00014-72-C-0125; NR Proj. 291-052)
(AD-744651) Avail: NTIS CSCL 14/2

The main purpose of this investigation was to select a system for the 170 atmosphere High Pressure Research Facility at the Department of Physiology, State University of New York at Buffalo. A combination of low temperature dehumidification followed by low temperature adsorption of water then adsorption of carbon dioxide appears to be best suited for this application. Data and references are included in the report to permit the reader to evaluate other design conditions. Author (GRA)

N72-33465# Southwest Research Inst., San Antonio, Tex.
AN INVESTIGATION OF SCUFFING CONDUCTED ON THE AFAPL DISK TESTER
H. J. Carper, E. L. Anderson, and P. M. Ku Jun. 1972 45 p refs
(Contract F33615-69-C-1295; AF Proj. 3048)
(AD-744842; SWRI-RS-586; AFAPL-TR-72-28) Avail: NTIS CSCL 14/2

The report presents the results of scuffing studies conducted on the AFAPL disk tester developed earlier. A total of 90 tests were conducted using AMS 6260 CEVM steel disks and a MIL-L-7808G lubricant at various combinations of sliding and sum velocities, at two lubricant jet temperatures, with two methods of driving the test disks, and in air and inert environments. The load-carrying capacity is seen to decrease with increasing sliding velocity, increase with increasing sum velocity, decrease with increasing lubricant jet temperature, decrease with belted as against unbelted drive, and decrease in the presence of an inert environment. The variations of the critical temperature, the minimum lubricant film thickness ratio at failure, and the friction coefficient at failure with respect to the variables investigated are presented and discussed.
Author (GRA)

N72-33466# Optoelectronics, Inc., Petaluma, Calif.
HgCdTe HIGH RELIABILITY Final Technical Report, 2 Nov. 1971 - 28 Apr. 1972
Warren R. Sheese May 1972 60 p refs
(Contract DAAK02-72-C-0113)
(AD-744787; PPI-1328) Avail: NTIS CSCL 17/5

The objective of the program was to design, fabricate, test, and deliver ten single element Mercury Cadmium Telluride (HgCdTe) detectors encapsulated in glass evacuated dewars. These units were to demonstrate high performance and high reliability operation at 77 K in the 8 to 14 micrometer spectral region, and have a low heat load dissipation. The detectors and dewars were also to have characteristics for high temperature storage and vacuum integrity. Author (GRA)

N72-33467# Shell Development Co., Emeryville, Calif.
COKER DEPOSIT MEASUREMENT USING BETA-RAY BACKSCATTER Technical Report, Jun. 1968 - Mar. 1972
H. T. Henderson, R. M. Curtis, and A. Telfer May 1972 82 p refs
(Contract F33615-70-C-1038; AF 33(615)-3789; AF Proj. 3048)
(AD-743308; S-14126; AFAPL-TR-72-36) Avail: NTIS CSCL 14/2

The report describes the development and application of an instrument for the measurement of coker tube deposits. Operation is based on backscattered low energy beta rays and a thin window proportional detector housed in a vacuum chamber in which the tubes are examined. Hydrocarbon deposits in the range of 30 to 3000 A thickness can be measured with good accuracy. A description is given of backscatter theory, design of the instrument, and of examples of the successful application of the instrument to coker tubes of various sizes. Data from several fuel thermal stability studies are presented in terms of maximum deposit thickness and total deposit mass for each tube. It is comparable in accuracy to combustion determination and has the added advantages of being nondestructive and of providing a complete deposit profile along the tube. Sufficient detail is included so that the report may be used as an operator's manual. Author (GRA)

N72-33468# Case Western Reserve Univ., Cleveland, Ohio. Chemical Engineering Div.
SPECTRAL ANALYSIS OF THE SIGNAL FROM THE LASER DOPPLER VELOCIMETER: TURBULENT FLOWS
Robert V. Edwards, John C. Angus, and John W. Dunning, Jr. 28 Mar. 1972 25 p refs
(Contract N00014-67-A-0404-0008; NR Proj. 062-446)
(AD-743530) Avail: NTIS CSCL 14/2

The power spectrum of phototube current from a Laser Doppler Velocimeter operating in the heterodyne mode has been computed. The spectrum is obtained in terms of the space time correlation function, for turbulent flow of the fluid. The spectral width and shape predicted by the theory is in agreement with experiment. For normal operating parameters the time average spectrum contains information only for times shorter than the Lagrangian integral time scale of the turbulence. To examine the long time behavior one must use either extremely small scattering angles, much longer wavelength radiation or a different mode of signal analysis, e.g., F.M. detection. Author (GRA)

N72-33469# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PIEZOELECTRIC-PIEZORESISTIVE COUPLED STRAIN TRANSDUCER M.S. Thesis
Gerald L. Cline Mar. 1972 117 p refs
(AD-743318; GE/EE/72-8) Avail: NTIS CSCL 14/2

The study explores the possibility of using a complementary coupling of the piezoresistive and piezoelectric effects to produce a very sensitive strain transducer. The piezoresistive effect of Si is combined with the piezoelectric effect of a ZnO thin-film in a new type of strain sensor, called the PZER. The polarization field of the ZnO activation layer changes the carrier density in the piezoresistive element. The PZER has up to 280% of the strain sensitivity of a normal piezoresistive strain transducer. The theory, fabrication, and evaluation of the PZER's is thoroughly discussed. Author (GRA)

N72-33470# Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF A PLATIUM WIRE RESISTANCE THERMOMETER SYSTEM M.S. Thesis
Edman Leon Sipe Mar. 1972 61 p refs
(AD-745145) Avail: NTIS CSCL 04/2

An analysis of the noise and response characteristics of an atmospheric temperature measuring system manufactured by National Electrolab Associated Limited was conducted.
Author (GRA)

N72-33471# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LOW FREQUENCY DIGITAL PHASE METER
V. I. Protsenko, L. A. Yevteyeva, I. V. Glushko, and V. D. Demidov 16 Mar. 1972 9 p Transl. into ENGLISH from Russian Patent no. 256862 (Appl. no. 1260372/18-10, 5 Aug.

1968), 1970 p 1-3
(AD-745448; FTD-HT-23-1364-71) Avail: NTIS CSCL 14/2

Phase difference measurements of quickly occurring changes can be obtained by a circuit with a digital display. The sinusoidal voltages which are to be compared are first converted into square waves and their durations are filled with h.f. pulses from a crystal generator. The packets of pulses are assessed by a binary counter and the results are passed on to the arithmetical unit. Another input of the arithmetical unit is supplied with packets of pulses produced in a second branch by filling spaces of square waves by switches with h.f. pulses from a crystal generator. In a mixer half waves detected are combined before the application to the arithmetical unit.

Author (GRA)

N72-33472# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

RESEARCH AND DEVELOPMENT OF A HIGH TEMPERATURE CAPACITANCE STRAIN GAGE FOR OPERATION AT 2000 F Final Report, Feb. 1970 - Jun. 1971

O. Larry Gillette Wright-Patterson AFB, Ohio AFFDL Oct. 1971 83 p refs
(Contract F33615-70-C-1181; AF Proj. 3170)
(AD-745449; SCG-10273R; AFFDL-TR-71-103; Rept-71(41)-08322/C0079) Avail: NTIS CSCL 14/2

The report describes the research and development of a high temperature capacitance strain gage. The investigation consisted of a materials, configuration, and attachment study; a cable evaluation; and a manufacturing and evaluation phase. The final configuration was a rhombic strain frame with a capacitor element composed of Inconel plates and mica dielectric insulators. The overgage length was 1/2 inch. Author (GRA)

N72-33473# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

PORTABLE TEMPERATURE SENSING TRANSMITTER Final Report

Peter Wagner 1972 4 p
(Grant NSF GI-12)
(PB-209632) Avail: NTIS HC $3.00 CSCL 13L

The subject invention relates to a portable, temperature-sensing transmitter that operates on the theory that the natural frequency of an electromechanical resonator can be made to vary with temperature. Although the primary application intended for the subject invention is the protection of fire-fighting personnel, it can be successfully used in any environment that requires remote thermal sensing. Author (GRA)

N72-33474# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.

SPHERICAL HYDROSTATIC GAS BEARING GYRO

Aubrey Rodgers 30 May 1972 19 p
(DA Proj. 1X2-22251-D-231; DA Proj. 1X2-22251-D-231)
(AD-745406; RG-TR-72-13) Avail: NTIS CSCL 17/7

The report summarizes the effort within the Guidance and Control Directorate on the development and evaluation of a spherical hydrostatic gas bearing gyro. The rotor is energized by a quick-reaction turbine drive mechanism. Light-actuated solid-state pickoffs generate electrical signals proportional to gyro case angular displacement relative to the space-fixed rotor. Evaluation results confirm a spin axis repeatability of 0.9 mr, drift rates less than 100 degrees/hour, and plus or minus 1 degree linear pickoff scale factor. Author (GRA)

N72-33789* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

STUDIES WITH SATELLITE RADIOMETER DATA

Milton Halem *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 42-46 (For availability see N72-33780 24-30)
CSCL 14B

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication; friction, and wear; manufacturing processes and quality control, and reliability; drafting; and materials fabrication, handling, and inspection.

N72-33475 Engineering Sciences Data Unit, London (England).

PRESSURE LOSSES IN VALVES

Oct. 1969 30 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-69022) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Data are presented on pressure loss for single-phase flow through a number of types of shutoff and simple flow control valves. The information is given in the form of nondimensional pressure loss coefficients and applies to liquid flow as well as gas flow at low Mach numbers. Author

N72-33476* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ELECTRIC MOTIVE MACHINE INCLUDING MAGNETIC BEARING Patent

Phillip A. Studer, inventor (to NASA) Issued 26 Sep. 1972 8 p Filed 8 Jan. 1971 Supersedes N71-34420 (09 - 21, p 3432)
(NASA-Case-XGS-07805; US-Patent-3,694,041; US-Patent-Appl-SN-104884; US-Patent-Class-308-10) Avail: US Patent Office CSCL 13I

A dc motor includes a number of stationary field windings and a stationary armature winding. Magnetic fluxes derived from the field windings interact with currents in the armature winding to produce a torque that rotatably drives a rotor about an axis that has a tendency to coincide with a common longitudinal axis for the armature and field windings. The displacement of the rotor axis relative to the common axis is sensed to provide a signal for controlling the currents in the field windings. The currents in the field windings displace the rotor so that the rotor axis has a tendency to coincide with the common axis. The rotor is thereby magnetically suspended, without mechanical or air bearings, by the same forces that rotate it. To maintain the rotor speed constant, the total current in the field windings is maintained constant. Official Gazette of the U.S. Patent Office

N72-33477* Beckman Instruments, Inc., Fullerton, Calif.

GAS OPERATED ACTUATOR Patent

Alex Ambruso, inventor (to NASA) Issued 26 Sep. 1972 5 p Filed 28 May 1971 Supersedes N72-20455 (10 - 11, p 1480) Sponsored by NASA
(NASA-Case-NPO-11340; US-Patent-3,693,346; US-Patent-Appl-SN-147997; US-Patent-Class-60-36; US-Patent-Class-60-1 US-Patent-Class-137-13; US-Patent-Class-137-81.5) Avail: US Patent Office CSCL 13I

A gas-operated actuator is described, including an expansion chamber with an inlet and an outlet containing a membrane or film of material selectively permeable to the drive gas when the membrane is heated. The inlet membrane communicates with a high pressure source of drive gas, and the outlet membrane communicates with a low pressure environment or a fluid environment reactive with the drive gas. The actuator is driven by alternately heating the inlet and outlet membranes to affect a cyclical expansion and contraction of the chamber. The actuator may contain a combined inlet-outlet and the membrane contained therein is alternately exposed to the drive gas and low pressure or reactive environment to effect the cyclical motion of the chamber.

Official Gazette of the U.S. Patent Office

N72-33478*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
TOTALLY CONFINED EXPLOSIVE WELDING Patent Application
Laurence J. Bement, inventor (to NASA) Filed 14 Sep. 1972 13 p
(NASA-Case-LAR-10941-1; US-Patent-Appl-SN-289048) Avail: NTIS HC $3.00 CSCL 13H

A simple means is described for eliminating the noise and debris of explosive welding techniques by totally enclosing and applying the explosive pressure through the wall of the enclosure. NASA

N72-33479*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE APPLICATION OF ELASTOHYDRODYNAMIC LUBRICATION IN GEAR TOOTH CONTACTS
Dennis P. Townsend 1972 56 p refs Presented at Intern. Lubrication Conf., New York, 9-13 Oct. 1972
(NASA-TM-X-68142; E-7146) Avail: NTIS HC $5.00 CSCL 11H

An analytical method is presented for determining elastohydrodynamic film thickness in gears from theory and how the film affects gear failure and life. The practical aspects of gear lubrication are presented, including mechanical and service variables which must be considered to obtain optimum gear performance under severe operating conditions. Author

N72-33480*# Marquardt Corp., Van Nuys, Calif.
THE DESIGN AND DEVELOPMENT OF A MINIATURE BI-STABLE LATCHING SOLENOID VALVE FOR LOW THRUST RESISTOJETS Final Report
R. A. Lynch Jun. 1972 90 p refs
(Contract NAS1-9601)
(NASA-CR-112161) Avail: NTIS HC $6.50 CSCL 13K

The design approach and development demonstration are presented for a flightweight, miniature, magnetic latching shutoff valve, suitable for use with the ruggedized H2 and NH3 resistojet and the biowaste resistojet. The design criteria established provided for compatibility with specified ruggedized resistojet propellants as well as the biowaste and other propulsion system propellants. Author

N72-33481*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
THERMAL SKIN FABRICATION TECHNOLOGY Final Report
T. B. Milam 27 Oct. 1972 186 p refs
(Contract NAS3-13312)
(NASA-CR-120988; FR-4976) Avail: NTIS HC $11.50 CSCL 13H

Advanced fabrication techniques applicable to Thermal Skin structures were investigated, including: (1) chemical machining; (2) braze bonding; (3) diffusion bonding; and (4) electron beam welding. Materials investigated were nickel and nickel alloys. Sample Thermal Skin panels were manufactured using the advanced fabrication techniques studied and were structurally tested. Results of the program included: (1) development of improved chemical machining processes for nickel and several nickel alloys; (2) identification of design geometry limits; (3) identification of diffusion bonding requirements; (4) development of a unique diffusion bonding tool; (5) identification of electron beam welding limits; and (6) identification of structural properties of Thermal Skin material. Author

N72-33482*# Batelle Columbus Labs., Ohio.
SUMMARY OF NONDESTRUCTIVE TESTING THEORY AND PRACTICE
R. P. Meister, M. D. Randall, D. K. Mitchell, L. P. Williams, and H. E. Pattee Washington NASA Oct. 1972 175 p refs
(Contract NASw-2018)
(NASA-CR-2120; BMI-NLVP-TM-71-1) Avail: NTIS HC $3.00 CSCL 14D

The ability to fabricate design critical and man-rated aerospace structures using materials near the limits of their capabilities requires a comprehensive and dependable assurance program. The quality assurance program must rely heavily on nondestructive testing methods for thorough inspection to assess properties and quality of hardware items. A survey of nondestructive testing methods is presented to provide space program managers, supervisors and engineers who are unfamiliar with this technical area with appropriate insight into the commonly accepted nondestructive testing methods available, their interrelationships, used, advantages and limitations. Primary emphasis is placed on the most common methods: liquid penetrant, magnetic particle, radiography, ultrasonics and eddy current. A number of the newer test techniques including thermal, acoustic emission, holography, microwaves, eddy-sonic and exo-electron emission, which are beginning to be used in applications of interest to NASA, are also discussed briefly. Author

N72-33483*# Whittaker Corp., San Diego, Calif. Research and Development Div.
DEVELOPMENT OF A CORE SHEATH PROCESS FOR PRODUCTION OF OXIDE FIBERS Final Report
Stanley Freske 12 Jul. 1972 34 p refs
(Contract NAS3-14324)
(NASA-CR-120996) Avail: NTIS HC $3.75 CSCL 13H

Improvements were sought in an oxide fiber of a core sheath configuration intended for structural applications at 2000 F (1093 C). Discontinuities in the core were eliminated by using core materials other than pure alumina, and continuous core sheath fibers were produced. In the case of some core materials, the continuous sections were sufficiently long for applications in short fiber composites. Creep at 2000 F (1093 C) was found to be due, in most cases, to breaks in the core, allowing the glass sheath to creep. Evidence was obtained indicating that a closer match between the thermal expansion coefficient of the sheath and the core would greatly improve the strength. Author

N72-33484*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF RESIDUAL STRESSES INDUCED BY PRESTRESSING ON ROLLING ELEMENT FATIGUE LIFE
Richard J. Parker and Erwin V. Zaretsky Washington Oct. 1972 18 p refs
(NASA-TN-D-6995; E-6922) Avail: NTIS HC $3.00 CSCL 14D

A mechanical prestress cycle suitable to induce compressive stress beneath the surface of the inner race of radially loaded 207-size bearings was determined. Compressive residual stress in excess 0.69 x 10 to the 9th power N/sq m (100,000 psi), as measured by X-ray diffraction, were induced at the depth of maximum shearing stress. The prestress cycle consisted of running the bearings for 25 hours at 2750 rpm at a radial load which produced a maximum Hertz stress of 3.3 x 10 to the 9th power N/sq m (480,000 psi) at the contact of the inner race and the heaviest loaded ball. Bearings subjected to this prestress cycle and subsequently fatigue tested gave a 10 percent fatigue life greater than twice that of a group of baseline bearings. Author

N72-33485*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEVELOPMENT OF A CONTAINER FOR HANDLING, TESTING, AND STORING DISCRETE MICROELECTRONIC COMPONENTS
George L. Filip and Salvadore V. Caruso 4 Oct. 1972 20 p
(NASA-TM-X-64699) Avail: NTIS HC $3.00 CSCL 13D

A container has been developed for handling, testing, burning-in, and storing discrete microelectronic components without removal from the protective package. The package was designed to accommodate the leadless inverted device and other carrier-mounted active devices and chip-type discrete resistors

and capacitors. Before the indicated development, components were handled and tested in various ways, some of which resulted in damage or contamination. The basic design of the container utilizes precision machined printed circuit boards and chemically milled (photoetched) contact springs. Included in this design for protection is an O-ring-sealed cover. Methods of fabrication and limitations of the current hardware are presented. Current applications of and possible extensions to the technology are discussed. Author

N72-33486# Goodyear Atomic Corp., Piketon, Ohio. Metallurgy Dept.
MICROPROBE STUDIES OF DISSIMILAR METAL WELD PROBLEMS
D. E. Boyd 18 Apr. 1972 35 p Presented at High Alloys Comm. of the Welding Res. Council Conf., New York, 18 Apr. 1972
(Contract AT(33-2)-1)
(GAT-T-1849; Conf-720418-1) Avail: NTIS

Results of electron microprobe studies being conducted using dissimilar metallic materials are reviewed. Data and information are included on Monel-carbon steel welds, nickel-carbon steel welds, and aluminum-nickel welds. NSA

N72-33487# Scientific Translation Service, Ann Arbor, Mich.
ELECTRODISCHARGE MACHINING
Apr. 1972 19 p refs Transl. into ENGLISH from VDI Richtlinien 3400 Prepared for Argonne Natl. Lab., Ill. Sponsored by AEC
(ANL purchase order 714670; STS Order 11622)
(ANL-Trans-913) Avail: NTIS

A revised guideline, based on electrodischarge machining, on metal removal processes is presented. Data cover machining processes in which material is removed from electrically conducting work pieces by sparks between the tool electrode and the workpiece in a dielectric fluid. Author

N72-33488# Philips Gloeilampenfabrieken N. V., Eindhoven (Netherlands).
QUALIFICATION TESTS ON REACTION FLYWHEELS SUPPORTED ON GREASE-LUBRICATED BEARINGS
J. G. G. Bos Paris ESRO Jul. 1972 176 p refs
(Contract ESTEC-1119/70)
(ESRO-CR-87) Avail: NTIS HC $11.00

A reaction flywheel with a grease-lubricated hydrodynamic bearing system was developed. This flywheel is designed for use in a space vehicle, where the excellent properties of the bearing system (the absence of mechanical wear and the insensitivity to overloading guarantee a long life, power consumption and starting torque can be low) are of importance. Several wheels are being life tested and have been running continuously for several years now: these tests prove the reliability of the flywheels under normal conditions of operation. The object of the investigations was to determine whether the flywheel, especially the bearing system, could survive the severe environmental conditions to which it would be subjected during the launch and to some extent in orbit. It was found that the mechanical strength of the system was sufficient to withstand the vibration shocks etc. experienced during the launch and that the specified thermal conditions were satisfied. Author (ESRO)

N72-33489# Waterloopkundig Laboratorium, Delft (Netherlands).
SCALING RULES FOR PUMPS [SCHAALREGELS VOOR POMPEN]
P. R. H. Verbeek Nov. 1971 21 p refs In DUTCH
(Publ-96) Avail: NTIS HC $3.25

Scaling laws are derived for pumps by using a dimensional analysis, and the formula for theoretical head as a basis. Cavitation properties are predicted for prototypes. The scaling laws enable the relationship between the pumping characteristics of similar pumps to be derived. This makes possible the use of the properties of a known pump to build a larger simular pump. The influence of viscosity, wall roughness and cavitation were neglected in deriving the scaling laws. Care must be taken regarding the role of cavitation bubbles in the prediction of the caviation properties of a prototype pump using model investigations. Author (ESRO)

N72-33490# Laboratorium fur Betriebsfestigkeit, Darmstadt (West Germany).
TORSIONAL FATIGUE STRENGTH AND SERVICE LIFE OF AXLE SHAFTS [VERDREHSCHWINGFESTIGKEIT UND BETRIEBSFESTIGKEIT VON ACHSWELLEN]
Alfred Buch, (Haifa Univ., Israel) 1972 30 p refs In GERMAN; ENGLISH summary
(TB-99) Avail: NTIS HC $3.50

Results of numerous torsional fatigue tests on axle shafts are compared with results from literature. Programmed amplitude tests using the typical cumulation frequency distribution of the torque in axle shafts of trucks, were considered, as well as constant amplitude tests. In particular, the influence of ultimate strength, surface conditions, shot peening, and induction hardening is analyzed. Surface decarbonation is found to have a significant effect on the fatigue life of axle shafts. Author (ESRO)

N72-33491# Technische Hochschule Aachen (West Germany). Lab. fuer Werkzeugmaschinen und Betriebslehre.
PROPOSAL FOR A PROJECT: COMPUTER AIDED DEVELOPMENT AND DESIGN OF MACHINE TOOLS [VORSCHLAG FUER EIN PROJEKT: RECHNERUNTERSTUETZTES ENTWICKELN UND KONSTRUIEREN IM WERKZEUGMASCHINENBAU]
M. Weck, H.-P. Wiendahl, U. Baatz, R. Gillessen, and K. Neuendorf Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Apr. 1972 110 p refs In GERMAN; ENGLISH summary Prepared in cooperation with Tech. Univ. Berlin Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-DV-72-02) Avail: NTIS HC $7.50; Zentralstelle fuer Atomkernenergie-dokumentation (ZAED), Leopoldshafen, West Ger., 22, 30 DM

A project is proposed for an integrated system of computerized design in the German machine tool industry. The project is based on the results of a survey carried out of representative firms in the machine tool industry and mechanical engineering in general. It became evident that the most promising way to overcome the problems encountered in design and construction was to introduce computers. A plan is therefore proposed which shows the structure of all the necessary components of an integrated system for computer aided development and design. All these components are concentrated in control, execution, and auxiliary systems as well as special hardware configurations. Author (ESRO)

N72-33492# Office of Naval Research, London (England).
COMPUTER AIDED DESIGN CONFERENCE
Franklin F. Luo and I. G. Kinnie 15 May 1972 12 p Conf. held at Southampton, England, 24-28 Apr. 1972
(AD-744236; ONRL-C-8-72) Avail: NTIS CSCL 13/8

During the week 24-28 April 1972, an International Conference and Exhibition on Computer Aided Design (CAD) was held at Southampton, England. The major themes represented in the Conference program were: Computer Graphics, Design Automation for Integrated Circuits and Logic Circuits, and various applications areas such as Control, Communications, Production and Organization, and General Engineering. Author (GRA)

N72-33493# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EFFECT OF A DIFFUSER ON THE POWER FACTOR MU' OF THE ROTOR WHEEL OF A CENTRIFUGAL COMPRESSOR
N. L. Zeldes 10 Mar. 1972 16 p refs Transl. into ENGLISH from Duigateli Vnutr. Sgoraniya, Sb. Rarot (Moscow), no. 9,

1969 p 116-123
(AD-745241; FTD-MT-24-1388-71) Avail: NTIS CSCL 13/7

The article discusses the effects of a diffuser on the power factor mu of a compressor rotor wheel, whereby the diffuser affects the flow after the wheel. Tests were made with different diffuser blade angles and with a vaneless diffuser and at various speeds. Author (GRA)

N72-33494# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF LUBRICANT FLOW RATE THROUGH A BEARING DEPENDING UPON THE LUBRICANT INLET
V. A. Karamzin 28 Apr. 1972 19 p refs Transl. into ENGLISH from the publ. "Razvitiye Gidrodinamicheskoy Teorii Smazki" USSR, 1970 p 36-43
(AD-745239; FTD-HT-23-518-72) Avail: NTIS CSCL 11/8

A study is made of the effect of the sliding rate, the specific pressure load, and viscosity of the lubricant and also the location of the lubricant inlet on the flow rate of a lubricant through a bearing. The flow process of the lubricant in the bearing clearance is analyzed. On the basis of theoretical and experimental studies an expression is obtained for the lubricant flow rate through a complexly loaded bearing considering the location of the lubricant inlet. The boundaries of the loaded zone are estimated. The effect of misalignment of the shaft and bearing axes on the thermal operating conditions of the bearing is investigated. Recommendations are made with respect to calculation, planning and design of complexly loaded sliding bearings. GRA

N72-33495# Lockheed-California Co., Burbank.
LOW TORQUE CONTROL BEARINGS Technical Report, 4 Jan. - 15 Dec. 1971
L. N. Foglesong 24 Mar. 1972 96 p
(AD-744903; LR-25006) Avail: NTIS CSCL 01/3

An investigation was made to establish a low torque rolling element control bearing design possessing optimum characteristics for manual control applications. Torque data measurements for this program were conducted by the Fafnir Bearing Company, New Britain, Conn., under contract to the Lockheed-California Company. Over 3770 rotary torque measurements, recorded and graphically persented for 88 control bearings representing 16 different configurations subjected to 4 radial load conditions, formed the basis for evaluating the torque inducing effects of various bearing components and configurations. GRA

N72-33496# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
BRONZE-BRAZED JOINTS FOR SEALING REBAR PENETRATIONS OF ELECTROMAGNETIC PULSE SHIELDS Final Report, Aug. - Dec. 1971
James R. Hossley Jun. 1972 64 p refs
(AD-744459; AEWES-Misc-Paper-N-72-7) Avail: NTIS CSCL 13/5

The objective of the study was to determine whether bronze brazing could be used to seal steel reinforcing bar penetrations through the electromagnetic pulse (EMP) shields of Perimeter Acquisition Radar Buildings (PARB) when such seal joints are required to withstand design loads without degradation of the EMP shielding properties or of the mechanical properties of the reinforcing bars. Initially, five tests were performed on three concrete-encased bars that represented full-scale penetrations of reinforcing bars (No. 11, Grade 75) through 1/4-inch-thick steel plates that represented the EMP shield. After completion of each test, the concrete was removed from the brazed joint, and dye penetrant was used to examine the joint for cracking.
Author (GRA)

N72-33497# California Univ., Berkeley.
STUDY OF DEFORMATION AND DEFECTS OCCURRENCE IN ADVANCED FORGING TECHNIQUES Technical Report, Jan. - Sep. 1971
Shiro Kobayaski, C. H. Lee, S. Sohrabpur, F. Kanacri, and L. R. Beck Wright-Patterson AFB, Ohio AFML Mar. 1972 104 p refs
(Contract F33615-70-C-1320; AF Proj. 7351)
(AD-744848; AFML-TR-72-3) Avail: NTIS CSCL 13/8

The report consists of two parts. In the first part, the detailed mechanics of flat-punch indentation into specimens of finite dimensions under plane-strain conditions were obtained, based on the observed flow patterns of commercially pure, hard copper specimens. In the second part, Hill's analysis for compression of a long rectangular strip was modified so that the analysis is applicable to compression of a rectangular block having any length-width ratio. The predictions were compared with experimental results obtained with annealed pure aluminum in terms of load-displacement relationships, changes in specimen geometry, flow lines and grid distortions. Also, a comparison was made for the load-displacement curves by the modified analysis and by the sand-heap analogy. Author (GRA)

N72-33498# Southwest Research Inst., San Antonio, Tex.
STUDIES WITH SYNTHETIC LUBRICANTS IN THE HOT-WALL DEPOSITION RIG Technical Report, 1 Feb. 1969 - 31 Jan. 1972
J. P. Cuellar, D. A. Montalvo, and B. B. Baber Wright-Patterson AFB, Ohio AFAPL Jun. 1972 69 p refs
(Contract F33615-69-C-1295; AF Proj. 3048)
(AD-744841; SwRI-RS-582; AFAPL-TR-72-25) Avail: NTIS CSCL 11/8

A detailed description is presented of the hot-wall deposition test method for evaluating deposit and degradation characteristics of aircraft turbine engine lubricants at various temperature severity levels. Deposition data are shown for twenty MIL-L-7808- and six MIL-L-23699-type lubricants studied at 350 F sump temperature and a range of 510 to 570 F heating fluid temperature. Concurrently with test development and lubricant evaluation, the hot-wall test was used in the interrelated studies of test precision, effects of variables, and correlation of deposit ratings with bearing deposition test results. Author (GRA)

N72-33499# Southwest Research Inst., San Antonio, Tex.
STUDIES ON THE OXIDATION-CORROSION-DEPOSITION AND THERMAL STABILITY CHARACTERISTICS OF MIL-L-7808-TYPE LUBRICANTS Technical Report, 1 Jun. 1970 - 1 Feb. 1972
J. P. Cuellar and B. B. Baber Wright-Patterson AFB, Ohio AFAPL Jun. 1972 76 p refs
(Contract F33615-69-C-1295; AF Proj. 3048)
(AD-744840; SwRI-RS-587; AFAPL-TR-72-45) Avail: NTIS CSCL 11/8

The report describes test methods and procedures used in the study of the oxidation-corrosion-deposition (O-C-D) characteristics of aircraft turbine engine lubricants employing a glassware-type apparatus. Development and evaluation of a light meter device for quantitative measurement of glassware deposits are also discussed. An extensive experimental effort using eight MIL-L-7808-type lubricants is described. The study encompassed an investigation of the factors of time, temperature, moisture, and metal types in relation to lubricant breakdown in an oxidizing (air) atmosphere. A similar, less extensive program was conducted for four lubricants using an inert (nitrogen) atmosphere. Author (GRA)

N72-33500# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF AN ANNULAR AIR BEARING WITH EXTERNAL PRESSURIZATION
F. I. Balandin Apr. 1972 15 p refs Transl. into ENGLISH from Gazov. Smazka Podship. (USSR), no. 9, 1968 p 209-218
(AF Proj. 7343)
(AD-743642; FTD-HC-23-123-72) Avail: NTIS CSCL 13/9

An annular thrust bearing with an external gas feed is the most suitable type of bearing for many machines. The possibility of vibrations occurring in this design is less than in other

bearings. The investigation of flow in the bearing clearance was carried out using the specified potential method. The method was used to determine the potential function satisfying the Laplace equation, which is derived from the simultaneous solution of motion and continuity differential equations for a laminar isothermal gas flow. A system of flows from three sources to three exits is reviewed. Experimental data are presented and a comparison is made with calculated results.
GRA

N72-33501# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORETICAL STUDY OF STATIC CHARACTERISTICS OF SPHERICAL AERODYNAMIC BEARINGS
I. V. Yakovlen 11 Apr. 1972 16 p refs Transl. into ENGLISH from Gazov. Smazka Podship (USSR), no. 9, 1968 p 113-124
(AF Proj. 7343)
(AD-743643; FTD-HC-23-125-72) Avail: NTIS CSCL 13/9

A theoretical analysis of the characteristics of spherical aerodynamic bearings is conducted on the basis of the solution of a well-known Reynolds equation. The experimental testing of the operation of spherical bearing confirmed in principle the correctness of the synthesis of the calculated characteristics.
GRA

N72-33502# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPTIMAL PARAMETERS AND COMPARATIVE CHARACTERISTICS OF THRUST GAP BEARINGS WITH SPIRAL CHANNELS OF VARIOUS TRANSVERSE PROFILES
A. V. Emelyanov and L. S. Yemelyanova 10 Apr. 1972 15 p refs Transl. into ENGLISH from Gaz. Smazka Podshipnikov (USSR), no. 9, 1968 p 189-199
(AF Proj. 7343)
(AD-743641; FTD-HC-23-122-72) Avail: NTIS CSCL 13/9

Self-pressurized gas bearings with spiral grooves have high operational characteristics. A study was made of the effect of the groove transverse profiles on the bearing characteristics. The application of special curvilinear coordinates made it possible to determine the gas layer friction without disregarding the pressure gradient in the direction of the relative velocity of the bearing plates.
GRA

N72-33503# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME CHARACTERISTICS OF THE LUBRICANT LAYER FULLY ENCLOSING A MAGNETIC GAS DYNAMIC BEARING
M. V. Korovshinskii 5 Apr. 1972 16 p refs Transl. into ENGLISH from Gasovaya Smazka Podshipnikov (USSR), no. 9, 1968 p 252-264
(AD-744382; FTD-HC-23-113-72) Avail: NTIS CSCL 13/9

An investigation was made of the carrying capacity, rotating friction, and the journal motion in a fully-enclosed bearing. It is assumed the end losses of the lubricant are absent. The lubricant layer characteristics were obtained by integration of appropriate equations describing the pressure distribution in the lubricating layer at different eccentricities and with variations of the dimensionless parameters of the current conducting gas.
Author (GRA)

N72-33504# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORETICAL ANALYSIS OF STABILITY OF THE EQUILIBRIUM POSITION OF NON-ABSOLUTELY RIGID BALANCED ROTORS IN GAS DYNAMIC FRICTION BEARINGS
G. A. Pospelov and V. A. Repin 10 Apr. 1972 35 p refs Transl. into ENGLISH from Gazovaya Smazka Podshipnikov (USSR), no. 9, 1968 p 125-154
(AD-743640; FTD-HC-23-121-72) Avail: NTIS CSCL 13/9

A theoretical analysis of the operation of gas dynamic bearings, whose bushings possess an ellipticity given (average radical clearance), is conducted.
Author (GRA)

N72-33505# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
A METHOD FOR DETERMINATION OF CONSTANT AND VARYING FRICTION FACTORS DURING RING COMPRESSION TESTS Technical Report, Jan. 1971 - Feb. 1972
Vincent DePierre and Fred Gurney 14 Apr. 1972 40 p refs
(Contract F33615-71-C-0063; AF Proj. 7351)
(AD-744850; AFML-TR-72-37) Avail: NTIS CSCL 13/8

Available mathematical analyses were applied to develop a reliable method for treating experimental results from ring compression tests with and without bulge formation for the following purposes: Quantitative evaluation of constant and varying friction factors, m, during testing; Determination of test material stress-strain curves.
Author (GRA)

N72-33506# Boeing Co., Philadelphia, Pa. Vertol Div.
OIL-STARVATION TEST PROGRAM: EVALUATION OF VASCO-X2 STEEL SPIRAL BEVEL GEARS Final Report, Oct. - Dec. 1971
J. P. Alberti and A. J. Lemanski Apr. 1972 81 p refs
(Contract DAAJ02-72-C-0009; DA Proj. 1F1-62205-AA-5201)
(AD-744506; D210-10384-1; USAAMRDL-TR-72-19) Avail: NTIS CSCL 13/9

The report presents the results of tests conducted to evaluate the performance of spiral bevel gears made from VASCO-X2 steel when they are operated without lubricating oil. Spiral bevel gears made from AISI 9310 steel and identical gears made, from VASCO-X2 steel were run under load in a regenerative (four-square) test stand. The purpose of this testing was to evaluate the effect of material properties on the performance of main power gears in a nonlubricated (loss-of-oil) environment.
Author (GRA)

N72-33507# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WORK EXPENDED IN WORK HARDENING AND FRACTURE OF FRICTION SURFACES IN DRY FRICTION OF STEELS
V. M. Ivanov 28 Mar. 1972 18 p refs Transl. into ENGLISH from Belaruss. Inst. Mekhaniz. Selsk. Haspadarki (Minsk), no. 11, 1968 p 321-334
(AD-743678; FTD-HT-23-1596-71) Avail: NTIS CSCL 13/8

Steels 20, 30, 45, and U-8 in the annealed and hardened states were used in a study of the dependence between wear during dry friction and the microhardness of the wearing surfaces. Determinations were made of the work of the frictional force expended in the increase of internal energy of the rubbing materials. Microhardness is shown to have different values at different sites on the friction surface due to the localization of the actual areas of contact. The maximum value of microhardness is attained at fracture sites.
Author (GRA)

N72-33508# AiResearch Mfg. Co., Phoenix, Ariz.
EVALUATION OF GAS LUBRICATED HYDRODYNAMIC BEARINGS IN A GAS TURBINE ENVIRONMENT Final Report, Mar. 1971 - Apr. 1972
Kendall R. Swenson, Nick M. Hughes, and Don F. Heuer Wright-Patterson AFB, Ohio AFAPL Jun. 1972 60 p
(Contract F33615-71-C-1376; AF Proj. 3048)
(AD-744844; AT-6129-R; AFAPL-TR-72-41) Avail: NTIS CSCL 13/9

The report contains a summary of the design analysis, development testing, and demonstration testing performed to demonstrate the feasibility of using gas lubricated hydrodynamic bearings in a gas turbine environment. The gas generator portion of the jet fuel starter used on the A7 D aircraft was modified to incorporate compliant-foil gas bearings and subjected to varied demonstration test. In addition, engine starts were made under conditions which simulated normal starting gear loads. Results of

the testing were very satisfactory. It is concluded that gas lubricated bearings can be used in a gas turbine application and further testing is encouraged. Author (GRA)

N72-33509# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Metallurgy and Materials Science.
TRANSIENT GROWTH OF SECOND PHASES DURING SOLUTION TREATMENT
R. W. Heckel, Anthony J. Hickl, Richard J. Zaehring, and Richard A. Tanzilli Jun. 1972 21 p refs Prepared in cooperation with Drexel Univ., Philadelphia, Pa.
(Contract N00014-67-A-0406-0002)
(AD-744973; TR-6) Avail: NTIS CSCL 13/8

The study shows experimentally that, in the initial stages of a solution treatment process, an unstable phase may grow prior to dissolving if the diffusion flux in the unstable phase is larger than that in the stable matrix. The effect was demonstrated using diffusion couples fabricated from thin, multiple layers of alpha and beta brass such that the mean compositions of the couples relative to the alpha-beta phase equilibrium would result in solution of the beta phase. Since at the diffusion temperature of 870 C the interdiffusion coefficient of the beta phase is about twenty times that of the alpha phase, the initial beta phase flux was much greater than that of the alpha phase. Author (GRA)

N72-33510# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONSIDERATION OF INFLUENCE OF INERTIAL FORCES IN BEARINGS OPERATING AT VARIABLE SPEEDS
I. Y. Tokar and A. D. Krioni 22 Mar. 1972 15 p refs Transl. into ENGLISH from Mashinostroenie (USSR), no. 5, 1970 p 107-114
(AD-745230; FTD-HC-23-1838-71) Avail: NTIS CSCL 13/9

The nonstationary problem of lubrication of cylindrical journal friction bearings of infinite width operating in a reversible mode, i.e., with angular velocities variable in both magnitude and direction, is studied. The maximum angular velocity during a reversing period is taken as the characteristic velocity.
Author (GRA)

N72-33511# Materials Research Lab., Inc., Glenwood, Ill.
FRACTURING CHARACTERISTICS OF ADHESIVE JOINTS Final Report, 1 Mar. 1971 - 30 Jan. 1972
Sheldon Mostovoy and E. J. Ripling May 1972 61 p refs
(Contract N00019-71-C-0329)
(AD-745010) Avail: NTIS CSCL 13/5

The report is one in a continuing series on the fracturing characteristics of adhesive joints. The studies were extended to include cracking in elevated temperature water. In addition, the effect of testing temperatures down to -321 F on the toughness of joints was also evaluated. Two types of dynamic effects were also studied: first, the effect on toughness of loading at rates up to those that cause the crack to approach its critical velocity, and second, corrosion fatigue of joints in a water environment.
Author (GRA)

N72-33512# Naval Air Development Center, Warminster, Pa. Aero Mechanics Dept.
ANALYTICAL INVESTIGATION OF MOTIONLESS COIL STORAGE (MCS) SYSTEM
S. L. Huang, A. R. Somoroff, and E. J. McQuillen 31 Dec. 1971 31 p refs
(AD-743930; NADC-AM-7129) Avail: NTIS CSCL 13/9

The main problem in the MCS development program is the operational limitation of pay-out speed to 1500 feet/minute associated with the formation of a reverse loop. This analytical investigation identifies the mechanics of reverse loop initiation, and provides a physical explanation of the phenomena. Then by means of a dynamic analysis, quantitative relations are provided among the variables which control reverse loop formation and operating parameters of the system. On the basis of quantitative analytical results, a solution is suggested in the form of a design modification required for practical elimination of reverse loop formation and attainment of higher operational pay-out speeds.
Author (GRA)

N72-33513# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
GENERATION OF A GAS EJECTOR IN THE CASE OF DIFFERENT PARAMETERS OF THE MIXING GASES
F. A. Kukanov and I. I. Mezhirov 21 Jan. 1972 14 p Transl. into ENGLISH from Uch. Zap. Tscentr. Aerogidrodinamicheskii Inst. (USSR), v. 1, no. 4, 1970 p 103-108
(AD-743693; FTD-MT-24-1140-71) Avail: NTIS CSCL 13/11

Results are given for an experimental investigation of a supersonic gas ejector with a constant stagnation temperature of the ejecting gas and various stagnation temperature values of the ejected gas. It was established that when given ejected gas equals 1500-2000 K the characteristics of the ejector are considerably below the calculated. It was shown that an injection of water into a stream of low-pressure gas improves the ejector characteristics and brings them into agreement with those calculated. Author (GRA)

N72-33514# Midwest Research Inst., Kansas City, Mo.
EFFECTS OF CHANGING SELECTED VARIABLES ON DYNAMIC FOAM AND AERATION TESTS RESULTS
William C. Lindsay, Webster D. Wood, and Ronald D. Butler Wright-Patterson AFB, Ohio AFAPL Jun. 1972 53 p
(Contract F33615-69-C-1265; AF Proj. 3048)
(AD-745330; AFAPL-TR-72-22) Avail: NTIS CSCL 11/8

The work was undertaken to determine the effect of varying conditions on the foaming properties of two oils. One oil, 0-67-10, gives consistently low foam volumes. The second oil, 0-65-12, gives a high foam volume. The test parameters investigated were air flow rate, altitude, oil volume, oil temperature, and air temperature. The following results were obtained. Foam volume appears to vary proportionally with air flow rate and directly with oil volume; Foam volume does not appear to vary uniformly with either altitude or oil temperature; Air temperature produced no discernible effect on foam volume; and Air flow rate has a more pronounced effect than altitude. Author (GRA)

N72-33515# Franklin Inst., Philadelphia, Pa.
PREDICTING PERFORMANCE OF GAS LUBRICATED SEALS USING ADVANCED NUMERICAL TECHNIQUES Interim Report
R. Colsher and W. Shapiro Jul. 1972 84 p refs
(Contract Nonr-2342(00); NR Proj. 062-316)
(AD-745333; FIRL-I-C2429-4) Avail: NTIS CSCL 11/1

Steady-state and dynamic performance of a gas-lubricated positive stiffness face seal was determined using advanced numerical methods based on a variable grid, finite difference, time-transient procedure. Comparisons were made between different numerical approaches used to solve the pressure distribution across the seal face and the Alternating Direction Implicit method was selected for the seal analyses. The resulting computer program was found to be faster (by a factor of 15) and more accurate than the previously employed straight implicit method. A detailed description of this method is also presented. Author (GRA)

N72-33111* National Aeronautics and Space Administration, Washington, D.C.
DYNAMICS OF NONLINEAR ELEMENTS WITH BREAKS IN THE KINEMATIC CHAIN
Yu. A. Stepanenko *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 155-166 refs (For availability see N72-33100 24-05) CSCL 05H

N72-33112* National Aeronautics and Space Administration, Washington, D.C.
DYNAMICS OF THE ACCELERATION OF THE DRIVE FOR

THE MOCKUP OF A DRILL PRESS TABLE WITH PROGRAMMED CONTROL
Kh. S. Samidov *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 167-180 refs (For availability see N72-33100 24-05)
CSCL 13I

N72-33114* National Aeronautics and Space Administration, Washington, D.C.
SOME PROBLEMS OF THE DYNAMICS OF MACHINES WITH NONLINEAR CHARACTERISTIC CURVES FOR THE LINKS
A. N. Golubentsev *In its* Mech. of Machines, No. 7/8 Oct. 1972 p 195-211 refs (For availability see N72-33100 24-05)
CSCL 13I

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid State.

N72-33516 Japan Broadcasting Corp., Tokyo.
HIGH QUALITY LASER COLOR TELEVISION DISPLAY
Teiichi Taneda, Sizuo Tatuoka, Meiki Aiko, Toshi Sato, and Hitoshi Masuko Apr. 1972 14 p refs
(NHK-Labs-Note-152) Copyright. Avail: Issuing Activity

The design, development, and configuration of a high quality laser color television display are discussed. The subjects discussed are: (1) polygonal mirror scanning system, (2) relay lens system, (3) automatic optical black-level control system, and (4) the optical system components. Line drawings and block diagrams are included to clarify the theoretical aspects. Author

N72-33517*# Laval Univ. (Quebec). Quantum Electronics Lab.
RUBIDIUM-87 GAS CELL STUDIES, PHASE 1 Rubidium Maser Development Report, 1 Apr. 1970 - 30 Apr. 1972
Jacques Vanier May 1972 61 p refs
(Grant NGR-52-133-001)
(NASA-CR-122457) Avail: NTIS HC $5.25 CSCL 20E

The construction of a quartz bulb-quartz cavity type rubidium maser is described, and the results obtained with two of these masers are presented. The tuning characteristics, medium term stability, and short term stability are reported. It is concluded that the stability of the masers in the short term region is superior to any of the oscillators presently existing. On this basis it is believed that future development of the masers to reduce their size and improve their medium term stability is well justified. Author

N72-33518# Central Electricity Generating Board, London (England).
HOLOGRAPHY AND MATERIALS TESTING: A SELECTIVE BIBLIOGRAPHY, 1967 - JANUARY 1972
P. G. Williams, comp. Jul. 1972 16 p refs
(CE-Bib-225) Avail: NTIS HC $3.00

An annotated bibliography is presented on holography and its applications to materials testing. The bibliography covers the period from 1967 to January 1972. K.P.D.

N72-33519# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
LASER BEAM BEHAVIOR ON A LONG HIGH PATH
J. B. Mason and J. D. Lindberg Apr. 1972 20 p refs
(DA Proj. 1T0-61102)
(AD-743849; ECOM-5430) Avail: NTIS CSCL 20/5

Observations of the atmospheric effects on a laser beam over a unique path are discussed. The path is 80 km long and 1.3 km above the surface. Correlations are discussed between temperature lapse rate at the path level and the spreading and deflection of the beam. Beam deflection and beam spread are found to be generally consistent with result obtained by others over lower and shorter paths. Diurnal movements of the beam are not nearly as noticeable, and on one occasion a remarkable degree of collimation occurred which lasted for several hours. It is concluded that such observations could be used for monitoring lapse rate. Author (GRA)

N72-33520# Naval Ordnance Lab., White Oak, Md.
AN ANALYTICAL INVESTIGATION OF THE EFFECT OF NOZZLE THROAT RADIUS OF CURVATURE ON GASDYNAMIC LASER GAIN
Jerry L. Wagner and John D. Anderson, Jr. 1 May 1972 26 p refs
(AD-744947; NOLTR-72-51) Avail: NTIS CSCL 20/5

Numerical solutions for CO2-N2 gasdynamic laser gain and maximum available power are used to examine the influence of nozzle throat radius of curvature and throat height on laser performance. Conventional gasdynamic laser nozzles incorporate minimum length supersonic contours with sharp throats in order to obtain rapid vibrational freezing of the gas. The study considers the effect of complete rounding of the throat (on both the subsonic and supersonic sides), up to a radius of curvature equal to three throat heights. Such rounding allows easier manufacture and alignment of the nozzles, and should result in improved flow quality. The present results show a 15-percent reduction in laser gain and maximum available power due to complete rounding of the throat. Author (GRA)

N72-33521# Sanders Associates, Inc., Nashua, N.H. Electro-Optics Div.
APPLICATIONS EVALUATION OF MATERIALS, 5067(YHG) R1 Final Report, 1 Mar. 1970 - 31 Aug. 1971
Charles S. Naiman, Robert C. Folweiler, Paul F. Murphy, William C. Fricke, and Evan P. Chicklis 13 Mar. 1972 131 p refs
(Contract F19628-70-C-0220)
(AD-743940; Rept-5067(YHG)R1; AFCRL-72-0204) Avail: NTIS CSCL 20/5

Contents: Evaluation of Spinel Powders as Diffuse Reflecting/Fluorescing Laser Cavity Material; Special study on uses of GeO2; Medium gain, high energy storage neodymium laser materials; Experimental evaluation of Schottky barrier detectors. GRA

N72-33522# United Aircraft Corp., East Hartford, Conn. Research Labs.
INVESTIGATION OF NONLINEAR PROPAGATION AND CHIRPING OF SHORT CO2 LASER PULSES Annual Summary Report, 1 Apr. 1971 - 31 Mar. 1972
Paul J. Berger, David C. Smith, Carl M. Ferrar, J. Terrence Flynn, and Peter K. Cheo Apr. 1972 107 p refs
(Contract N00014-69-C-0308; NR Proj. 016-204)
(AD-743491; L920832-4) Avail: NTIS CSCL 20/5

The research investigations have led to the development of an acousto-optic modulator for mode-locking the high pressure CO2 laser. Nanosecond pulses have been generated with peak powers of about 25 Megawatts, the high peak power resulting from low insertion loss Brewster-angled germanium modulator. A photon-drag detector with a response time of 0.3 nsec was also developed for observing the mode-locked pulses. The design of a solid-cathode double-discharge electrically pulsed CO2 laser is described. Preliminary studies of thin film GaAs waveguides for 10.6 micron wavelength radiation have been undertaken with a view to the development of future modulators. A continuing semi-empirical design approach has resulted in an operational, though still short-lived, flowing copper vapor laser based on a continuous evaporation-condensation flow cycle. GRA

N72-33523# Aerospace Corp., El Segundo, Calif. Lab. Operations.
TIME RESOLVED SPECTROSCOPY OF A FLASH INITIATED

H2-F2 LASER, NOVEMBER 1970 - JANUARY 1971
Steven N. Suchard, Rolf W. F. Gross, and James S. Whittier
30 Jun. 1972 16 p refs
(Contract F04701-71-C-0172)
(AD-744821; TR-0172(2753)-2; SAMSO-TR-72-157) Avail: NTIS CSCL 20/5

The time-dependent output spectrum of a helium-diluted H2-F2 chain reaction chemical laser has been observed. Reaction of a 50-Toor mixture with mole ratio H2:F2:He - 1:1:60 was initiated by flash photolysis of the F2. Strong lasing was found from P-branch vibration-rotation transitions of the v = 1 to 0, 2 to 1, 3 to 2, and 4 to 3 bands of HF. Within some bands, the time sequence of transitions suggests non-Boltzmann distributions of rotational states. No lasing from vibrational levels higher than 4 could be detected. Author (GRA)

N72-33524# Perkin-Elmer Corp., Wilton, Conn.
ELECTROSTRICTIVE LASER BEAM TRAPPING Final Report, 1 Apr. 1969 - 31 Mar. 1972
Edwin L. Kerr May 1972 24 p refs
(Contract F19628-69-C-0220; AF Proj. 6100)
(AD-745209; PE-11012; AFCRL-72-0272) Avail: NTIS CSCL 20/5

The report summarizes the results of the electrostrictive laser beam trapping contract. The abstracts of nine research articles are listed, as well as unpublished talks and reports. In addition, the report contains an analysis of thermal self-focusing. The thermal self-focusing power threshold is derived, along with equations for making computer movies of thermal self-focusing. Author (GRA)

N72-33525# United Aircraft Corp., East Hartford, Conn. Research Labs.
INVESTIGATION OF ENERGY TRANSFER PROCESSES IN MOLECULAR GAS DISCHARGES Final Report, 1 Jun. 1970 - 30 Jun. 1972
Walter J. Wiegand, William L. Nighan, and Robert H. Bullis
30 Jun. 1972 65 p refs
(Contract F19628-70-C-0165; AF Proj. 8659)
(AD-745211; UARL-L920938-8; AFCRL-72-0276) Avail: NTIS CSCL 20/5

Collision processes leading to the formation of atomic nitrogen in N2-He and N2-CO2-He laser discharges have been identified as being of major importance in determining discharge characteristics. In order to identify the physical mechanisms leading to N2 dissociation, analytical techniques were used to determine electron energy distributions, from which rates of electron energy transfer associated with the various vibrational, electronic, ionization and dissociation processes were determined. Carefully controlled experimental measurements were made to determine N-atom fluxes as a function of discharge parameters. The measured dissociation rate and its dependence on electron density, N2 density, and time spent within the discharge suggested that both direct and multistep processes contributed to the N-atom production. These results, when coupled with the analytically determined energy transfer rates, indicate that only direct processes are important sources of N-atom production for conditions typical of CO2 laser discharges. Author (GRA)

N72-33526# Aerospace Corp., El Segundo, Calif. Lab. Operations.
NEW COMPOUNDS FOR USE IN HF LASERS Technical Report, 1 Jul. 1970 - 30 Jun. 1971
Spencer M. King, Munson A. Kwok, David Taylor, and Stanley W. Mayer 30 Jun. 1972 22 p refs
(Contract F04701-71-C-0172)
(AD-745128; TR-0172(9210-02)-2) Avail: NTIS CSCL 20/5

A study was conducted to find new F and H containing compounds that would produce lasing in electrically pulsed HF chemical lasers. The emphasis in the study was on seeking economical, safe, and storable chemicals. Spectroscopic analyses of the lasing outputs were made. The compounds included CH3CHF2, NF3, IF5, SF6, PR5, CF4, CF8, SiF4, SO2F2, and SOF2. Author (GRA)

N72-33527# Aerospace Corp., El Segundo, Calif.
SURFACE ABSORPTION OF 10.6 MICROMETER RADIATION ON THE ALKALI HALIDES
Daniel H. Barker, Armand B. Chase, and Thomas S. Hartwick
15 Mar. 1972 14 p refs
(Contract F04701-71-C-0172)
(AD-745297; SAMSO-TR-72-164; SAMSO-TR-72-164) Avail: NTIS CSCL 20/5

An investigation of surface absorption at 10.6 micrometers in NaCl crystals is reported. The purpose of this study was to establish the relative contributions of absorbed water on the crystal surface and interior to .otal absorption. The findings indicate that the principal absorption mechanism is not attributable to water absorption, either in bulk or on the surface. There is indicated a strong relationship between surface scattering and absorption. A comparison of findings with earlier work is discussed. Author (GRA)

N72-33528# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
PARAMETRIC STUDIES OF THE DF-CO2 CHEMICAL TRANSFER LASER Technical Report, 10 Jun. 1970 - 3 Jun. 1971
Theodore J. Falk Jun. 1972 77 p refs
(Contract F29601-70-C-0066; AF Proj. 3326)
(AD-745450; CAL-RF-2966-A-1; AFWL-TR-71-96) Avail: NTIS CSCL 20/5

Parametric studies of the power output of a D2/F2/CO2 laser were performed. A transverse-flow nitric-oxide-initiated De/F2/CO2 laser was constructed and tested at various power levels up to 560 watts. It was found that: viscous and thermal boundary layers had negligible effect in 1 inch x 6 inch flow channel tested. With a fixed optical cavity and with constant flow rates of deuterium, fluorine, and carbon dioxide, the effects of nitric oxide flow rate, helium flow rate, and operating static pressure were interrelated in a manner which suggested tuning of the D2-F2 reaction length to the length of the laser cavity. The pressure at which peak power was reached, however, increased with increasing helium flow rate. All data obtained with fixed ratio of CO2 flow rate to fluorine flow rate and with optimum NO flow rate could be correlated on the basis of chemical efficiency and a parameter called the equivalent pressure. Author (GRA)

N72-33529# General Electric Co., Philadelphia, Pa. Missile and Space Div.
DESIGN CONSTRUCTION AND EVALUATION OF A MOBILE LIDAR SYSTEM FOR THE REMOTE MEASUREMENT OF SMOKE PLUME OPACITY Final Report, 24 Dec. 1969 - 21 Dec. 1971
C. S. Cook and G. W. Bethke Dec. 1971 100 p refs
(Contract EPA-68-02-0093)
(PB-210672; APTD-0968) Avail: NTIS HC $3.00 CSCL 13B

A mobile (truck mounted) ruby laser lidar system has been designed, constructed and evaluated for the remote measurement of smoke plume opacity (or transmittance). The system has been tested at ranges of 211 and 319 meters using synthetic targets of known laboratory measured transmittance. The targets used were made of bright and black anodized aluminum screen, glass, plexiglass, white painted plywood and black felt. These tests indicated an error which increased as target reflectance increased. In general, the lidar and telephotometer determined transmittance values agreed within the accuracy expected for a given plume transmittance as indicated by the synthetic target test results. Plume-to-sky contrast (plume visibility) was found to have no correlation with plume transmittance because of the variability of ambient illumination of the plume. GRA

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N72-33530 National Lending Library for Science and Technology, Boston Spa (England).
A STUDY OF THE CORROSION CRACKING OF Al-Zn-Mg-Cu ALLOYS
V. D. Valikov and V. C. Sinyarski 7 Jun. 1972 15 p refs Transl. into ENGLISH from Korroziya i Zashchita metal., Sb. (Moscow), no. 6, 1970 p 75-83
(NLL-DRIC-Trans-2682-(3623.66); NLL-BR-30051) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The corrosion cracking of aluminum-zinc-magnesium-copper alloys is discussed. The subjects presented are: (1) production of test specimens and method of test, (2) influence of chemical composition, (3) influence of heat treatment method, (4) effect of aging, (5) production techniques. Tables of data are included to amplify the test results. Author

N72-33531*# Boeing Co., Seattle, Wash. Aerospace Group.
DETERMINATION OF DESIGN ALLOWABLE PROPERTIES. FRACTURE OF 2219-T87 ALUMINUM ALLOY
W. L. Engstrom Mar. 1972 253 p refs
(Contract NAS9-10364)
(NASA-CR-115388; D180-14480-1) Avail: NTIS HC $14.75 CSCL 11F

A literature survey was conducted to provide a comprehensive report of available valid data on tensile properties, fracture toughness, fatigue crack propagation, and sustained load behavior of 2219-T87 aluminum alloy base metal and weldments, as applicable to manned spacecraft tankage. Most of the data found were from tests conducted at room temperature, -320 F and -423 F. Data are presented in graphical and tabular form, and areas in which data are lacking are established. Author

N72-33532*# TRW Equipment Labs., Cleveland, Ohio. Materials Technology.
GENERATION OF LONG TIME CREEP DATA ON REFRACTORY ALLOYS AT ELEVATED TEMPERATURES
Semiannual Report, 8 May - 8 Nov. 1971
K. D. Sheffler and R. R. Ebert 8 Nov. 1971 81 p refs
(Contract NAS3-15554)
(NASA-CR-120867; TRW-ER-7567) Avail: NTIS HC $6.25 CSCL 11F

Ultrahigh vacuum creep tests were conducted on tantalum, tungsten, and molybdenum alloys to develop creep data and to evaluate the influence of liquid lithium exposure on the creep behavior of the tantalum alloy T-111. Test conditions were generally selected to provide 1% creep in 1000 to 10,000 hours, with test temperatures ranging from 1600 to 2912 F (1144 to 1873 K). Tests on T-111 specimens exposed to vacuum and to liquid lithium for various times and temperatures showed large reductions in creep strength for exposures in the 1800 to 1900 F (1255 to 1310 K) range. Tests on the ASTAR 811c showed a significant influence of grain size on the creep strength of this material, with larger grain size specimens being significantly stronger above the equicohesive temperature of 2000 F (1366 K). Author alloy

N72-33533*# TRW Equipment Labs., Cleveland, Ohio.
GENERATION OF LONG TIME CREEP DATA ON REFRACTORY ALLOYS AT ELEVATED TEMPERATURES
Final Report, 8 Nov. 1970 - 8 May 1971
K. D. Sheffler 20 May 1971 87 p refs
(Contract NAS3-13469)
(NASA-CR-72997; TRW-ER-7541) Avail: NTIS HC $6.50 CSCL 11F

Ultrahigh vacuum creep tests were performed on tungsten, molybdenum, and tantalum alloys to develop design creep data and to evaluate the influence of liquid lithium exposure on the creep resistance of a tantalum alloy. Test conditions were generally selected to provide 1% creep in 1000 to 10,000 hours, with the test temperatures ranging between 1600 and 2900 F (1144 K and 1866 K). One percent creep life data from a tantalum-base T-111 alloy (Ta-8%W-2%Hf) were analyzed using a station function method to provide an improved parametric representation of the T-111 data. In addition, the minimum creep rate data from an ASTAR 811C alloy (Ta-8%W-1%Re-0.7%Hf-0.025%C) were analyzed to determine the stress and temperature dependence of creep rate. Results of this analysis indicated that the activation energy for creep decreased from about 150 Kcal/mole (5130 J/mole) above 2400 F (1589 K) to about 110 Kcal/mole (3760 J/mole) below 2000 F (1361 K). This temperature range corresponds to the range where the creep mechanism changes from grain boundary sliding to intragranular creep. Author

N72-33534*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF HIGH TEMPERATURE CREEP AND OXIDATION ON RESIDUAL ROOM TEMPERATURE PROPERTIES FOR SEVERAL THIN SHEET SUPERALLOYS
Dick M. Royster and W. Barry Lisagor Washington Nov. 1972 119 p refs
(NASA-TN-D-6893; L-8180) Avail: NTIS HC $3.00 CSCL 11F

Superalloys are being considered for the primary heat shields and supports in the thermal protection system of both hypersonic transport and space shuttle vehicles. Since conservative design philosophy dictates designs based on residual material properties at the end of the service life, material characterization after exposure to the environmental conditions imposed by the flight requirements of these two classes of vehicles is needed on the candidate alloys. An investigation was conducted to provide some of the necessary data, with emphasis placed on oxidation, creep, and residual properties of thin-gage sheet material. Author

N72-33535*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSFORMATION TEMPERATURES OF MARTENSITE IN BETA PHASE NICKEL ALUMINIDE
James L. Smialek and Robert F. Hehemann Washington Oct. 1972 15 p refs
(NASA-TM-X-2654; E-7073) Avail: NTIS HC $3.00 CSCL 11F

Resistivity and thermal arrest measurements determined that the compositional dependence of Ms (martensite state) temperatures for NiAl martensite was linear between 60 and 69 atomic percent nickel, with Ms = 124 Ni - 7410 K. Resistivity and surface relief experiments indicated the presence of thermoelastic martensite for selected alloys. Some aspects of the transformation were studied by hot stage microscopy and related to the behavior observed for alloys exhibiting the shape-memory effect. Author

N72-33536# Sandia Labs., Albuquerque, N.Mex.
DYNAMIC RESPONSE OF HEATED POROUS ALUMINUM
R. Ng and B. M. Butcher Jan. 1972 40 p refs Sponsored by AEC
(SC-RR-710790) Avail: NTIS

The mechanical response of porous materials heated to melting and vaporization energy levels was investigated. Porous aluminum samples (2.16 g/cc) were exposed in electron beam experiments to 700 keV electron dosages of 45, 75, 95, and 105 cal/sq cm. In the test configuration, the samples were backed by fused silica buffers which in turn were backed by quartz gages. Incident radiation of 45 cal/sq cm heated the entire sample above the energy level for incipient melting, and 95 cal/sq cm was sufficient to produce some material vaporization.

The quartz gage record from the 75 cal/sq cm experiment, which was considered the most reliable, showed that an upper bound for the initial thermal stress was 0.5 kbar for an energy of 1.1 kJ/g. This stress value was less in magnitude than the room temperature 1.0 kbar yield strength of the material. In addition, a more detailed estimate of initial thermal stress in the material, based on its room temperature compaction properties, predicted a stress of 2.3 kbar for this energy level. Author

N72-33537# European Space Research and Technology Center, Noordwijk (Netherlands). Materials Section, Quality and Reliability Div.

A METHOD FOR BLACK-ANODISING ALUMINIUM WITH INORGANIC DYES

1 Oct. 1971 14 p

(ESRO-PSS-13/QRM-03P-Issue-1) Avail: NTIS HC $3.00

A method of black anodizing is described which makes use of cobalt and nickel sulfide dyes and is intended for the treatment of aluminum spacecraft surfaces. The optical qualities and the stability in the space environment of the dyes is considered good. Author (ESRO)

N72-33538# Army Foreign Science and Technology Center, Charlottesville, Va.

HANDBOOK OF MECHANICAL PROPERTIES OF STEELS AND ALLOYS DURING PLASTIC DEFORMATION

A. V. Tretyakov, G. K. Trofimov, and M. K. Guryanova 19 May 1972 85 p refs Transl. into ENGLISH of the publ. "Mekhanichekiye Svoystva Staley i Splavov pri Plasticheskom Deformirovanii Spravochnik" Moscow, Mashinostr., 1971 63 p

(AD-745246; FSTC-HT-23-1048-72) Avail: NTIS CSCL 11/6

The handbook gives data on changes in the mechanical properties of steels and alloys during plastic deformation. Empirical formulas are given for determining: the yield point, the critical point, relative elongation and hardness in relation to the degree of deformation of the steel and alloy in a cold state. Tables of actual resistances are given for deformation in a hot state relative to temperature, degree and rate of deformation. Indices of plasticity and deformability are considered.

Author (GRA)

N72-33539# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MATERIALS SCIENCE AND MODERN TECHNOLOGICAL PROGRESS

I. M. Fedorchenko 5 Apr. 1972 15 p Transl. into ENGLISH from Vis. Akad. Nauk. Ukr. RER (Kiev), no. 11, 1970 p 51-57

(AD-745235; FTD-HC-23-80-72) Avail: NTIS CSCL 11/6

The article is a survey of achievements in the field of materials science and problems that remain to be solved, with special emphasis on the work being done in the Ukrainian SSR. Of particular importance are new materials for solving problems in space technology. There was the unique experiment on the welding and cutting of metals in space during the orbital flight of the ship Soyuz-6. Materials are of great importance for the further development of machine building, with materials created by powder metallurgy methods playing an important role. Promising materials include antifriction cermets from iron and bronze powders, wear resistant cermets based on chromium carbide alloys, high porous cermet filters, new heat resistant materials based on dislocation theory, and refractory compounds.

Author (GRA)

N72-33540# Naval Research Lab., Washington, D.C.

THE RESISTANCE OF SOME HIGH STRENGTH STEELS TO SLOW CRACK GROWTH IN SALT WATER

G. Sandoz Feb. 1972 29 p refs

(ARPA Order 878)

(AD-744944; NRL-MR-2454) Avail: NTIS CSCL 11/6

The results of tests to determine the threshold stress intensity parameter values for crack growth in salt water of some high strength steels are given. A number of martensitic, maraging, and precipitation-hardening steels over a range of yield strengths are included. Author (GRA)

N72-33541# Army Materials and Mechanics Research Center, Watertown, Mass.

DEVELOPMENT OF TRIP STEELS FOR ARMY APPLICATIONS Interim Technical Report, 1 Jul. 1970 - 30 Jun. 1971

Morris Azrin, Roger A. Gagne, Kenneth D. Holmes, Francis C. Quigley, and Lawrence Shepard Dec. 1971 27 p refs

(DA Proj. 1T0-62105-A-328)

(AD-744792; AMMRC-TR-71-57) Avail: NTIS CSCL 11/6

Development of techniques for air-induction melting of TRIP steel alloys was investigated. Sound ingots of Type A-2 TRIP steel were produced, processed, and are currently undergoing mechanical testing. Several methods for monitoring martensitic transformation were evaluated. A ferromagnetic technique remains to be appraised. Various homogenization treatments were investigated in order to optimize microstructure prior to thermomechanical processing. Author (GRA)

N72-33542# Lockheed-California Co., Burbank.

THE EFFECT OF FRETTING DAMAGE ON THE FATIGUE BEHAVIOR OF METALS Technical Report, Jun. 1971 - May 1972

David W. Hoeppner and Gary L. Goss 31 May 1972 54 p refs

(Contract N00014-71-C-0299)

(AD-743515; LR-25317; TR-1) Avail: NTIS CSCL 11/6

Fretting fatigue studies were conducted on Ti-6Al-4V and 7075-T6 aluminum specimens cycled in axial fatigue loading at a fatigue ratio (R) of 0.1. Fatigue loading was applied at 30 Hz in a laboratory environment with the fatigue specimen loaded in fatigue and fretting applied to the specimen central section through a fretting pad made of the same material as the specimen. Tests were conducted at various maximum loads and normal pressures. Author (GRA)

N72-33543# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

RESEARCH ON THE PRELIMINARY DISPLACEMENT OF METAL-POLYMER FRICTION PAIRS

D. T. Avdeev 24 Jan. 1972 12 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Mashinostro. (Moscow), no. 3, 1970 p 33-37

(AF Proj. 7343)

(AD-743650; FTD-MT-24-1432-71) Avail: NTIS CSCL 11/6

The experimental investigation of the predisplacement of the metal polymeric friction couples plastic PM and alloy AMG, stainless steel self lubricating material D, resin P-68 and steel 35, aluminum polyethylene ND, and Teflon and steel 35 is described. The investigation results are discussed by reference to diagrams showing the predisplacements vs time and shifting force. Author (GRA)

N72-33544# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MACHINE CONSTRUCTION STEELS WITH RARE-EARTH IMPURITIES

A. S. Zavyalov and M. M. Sandomirskiy 29 Mar. 1972 179 p refs Transl. into ENGLISH of the publ "Mashinostroitelnyye Stali s Redkozemelnymi Prisadkami" Leningrad, Mashinostr., 1969 p 1-127

(AD-743682; FTD-MT-24-1194-71) Avail: NTIS CSCL 11/6

The book is dedicated to research on the possibilities of using rare-earth metals (cerium, lanthanum, praseodymium and neodymium) as alloying elements of structural steel. The questions of the influence of rare-earth metals on the phase transformations and the phase composition of steel, on the mechanical and physical properties and the technological features of structural steel with rare-earth additives are brought to light.

Author (GRA)

N72-33545# Kentucky Univ., Lexington. Dept. of Metallurgical Engineering and Materials Science.
INVESTIGATIONS TO UNDERSTAND THE PLASTIC DEFORMATION AND STRENGTHENING MECHANISMS OF SOLID SOLUTION PHASES OF TITANIUM Technical Report, Feb. 1968 - May 1971
H. Conrad, M. Doner, and B. DeMeester May 1972 62 p refs
(Contract F33615-68-C-1052; AF Proj. 7351)
(AD-744711; UKY-50-72-MET-15; AFML-TR-72-84) Avail: NTIS CSCL 11/6

The paper is a review of the present state of our understanding of the plastic flow and fracture of titanium. Special attention is given to identifying the dislocation mechanisms which are operative and controlling. Author (GRA)

N72-33546# Southwest Research Inst., San Antonio, Tex. Dept. of Instrumentation Research.
NONDESTRUCTIVE EVALUATION OF METAL FATIGUE
F. N. Kusenberger, J. Lankford, Jr., P. H. Francis, and J. R. Barton Apr. 1972 80 p refs
(Contract F44620-70-C-0034; AF Proj. 9782)
(AD-743312; AFOSR-72-1167TR) Avail: NTIS CSCL 11/6

The important role of nondestructive evaluation (NDE) methods in complementing the tools of fracture mechanics for preventing catastrophic fatigue failures in engineering structures is discussed. Magnetic perturbation signatures from surface and subsurface fatigue cracks in AISI 4340 steel rod-type axially loaded specimens are illustrated, compared, and considered in terms of the plastic zone and residual stresses in the vicinity of the fatigue cracks. Also, magnetic records from drilled holes and fatigue cracks in 4340 and maraging steels are presented which show significant differences in response from the two materials. Preliminary acoustic emission investigations on rod-type specimens containing surface fatigue cracks are reviewed and the results compared with those from single edge-notched flat specimens.
Author (GRA)

N72-33547# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
CLADDINGS OF SUPERIOR CORROSION RESISTANCE FOR HIGH STRENGTH ALUMINUM ALLOYS
Fred H. Meyer, Jr. Feb. 1972 37 p refs
(AF Proj. 7381)
(AD-743311; AFML-TR-71-244) Avail: NTIS CSCL 11/6

The report summarizes the results of an evaluation of the corrosion performance of various experimental claddings on 7075-T6 aluminum alloys, in certain natural environments for periods up to 24 months. Claddings tested were 1199, 5457, 7004, 7472, 7072, and 7039 aluminum alloys. The superiority of 1199 and 5457 alloy cladding from the corrosion standpoint in tropical, semitropical, and temperate climates was confirmed. Corrosion related blistering of the clad layer indicate some modification of composition of 1199 and 5457 alloys might be desirable for long-term corrosion performance. Alloys 7004 and 7472 also were found to be superior to 7072 cladding from the corrosion standpoint but not equal to 1199 or 5457 alloys.
Author (GRA)

N72-33548# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THERMAL CONSTANTS AT HIGH TEMPERATURES. 3: THE ANOMALOUS THERMAL EXPANSION OF BISMUTH, ZINC, AND CADMIUM NEAR THE MELTING POINT
V. F. Gachkovskii and P. G. Strelkov 20 Jan. 1972 34 p refs
Transl. into ENGLISH from Zh. Eksperim. i Teor. Fiz. (Moscow), v. 7, no. 4, 1937 p 532-548
(AD-743669; FTD-MT-24-1599-71) Avail: NTIS CSCL 11/6

Since a certain amount of information exists relative to the unique anomaly of thermal expansion of bismuth, the authors undertook the task to explain whether or not zinc and cadmium display this anomaly. All measurements were made on a dilatometer with precision temperature control. In bismuth the anomaly begins already approximately by 40 C, and in zinc and cadmium approximately by 10 degrees prior to melting. GRA

N72-33549# Aluminum Co. of America, Pittsburgh, Pa.
FURTHER DEVELOPMENT OF ALUMINUM ALLOY X7050 Final Report, 16 Sep. 1970 - 15 Feb. 1972
J. T. Staley 8 May 1972 124 p refs
(Contract N00019-71-C-0131)
(AD-743518) Avail: NTIS CSCL 11/6

Results of exposures of short-transverse specimens of X7050 plate in an inland industrial atmosphere and a seacoast atmosphere for up to 840 days were analyzed. An X7050-T7352 hand forging and two X7050-T736 die forgings were fabricated, and properties were compared with those of 7075-T6 and 7079-T6 forgings. Effects of isothermally aging X7050 plate at 300 F or 325 F and of preceding the age at 325 F by a pre-age at 250 F were determined. Author (GRA)

N72-33550# Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering.
RELATIONSHIP BETWEEN INTERNAL DAMPING AND SUSCEPTIBILITY TO STRESS CORROSION CRACKING
A. Hochrein, Jr. and A. Thiruvengadam Jan. 1972 112 p refs
(Contract N00014-67-A-0377-0003)
(AD-744687) Avail: NTIS CSCL 11/6

An experimental investigation of stress corrosion cracking in metals is reported for several alloy-corrodent systems. Internal damping measurements were made on the metals in the as-received condition and after they had been exposed to a corrosive environment. Author (GRA)

N72-33551# United Aircraft Corp., East Hartford, Conn.
EFFECT OF VANADIUM AND SODIUM COMPOUNDS ON ACCELERATED OXIDATION OF NICKEL-BASE ALLOYS Annual Report, 1 Mar. 1971 - 29 Feb. 1972
Norman S. Bornstein, Michael A. Decrescente, and Hilton A. Roth Jun. 1972 60 p refs
(Contract N00014-70-C-0234; NR Proj. 036-089)
(AD-745292; UARL-L910983-4) Avail: NTIS CSCL 11/6

The relationship between vanadium oxide, Na2SO4 and accelerated rates of oxidation of nickel base alloys was studied. It was shown that oxides such as V2O5 and MoO3 behave like Cr2O3 (which is an effective sulfidation inhibitor) and effectively reduce the oxide ion content of Na2SO4. However, whereas Cr2O3 is relatively innocuous with respect to Al2O3, the oxides of V2O5 and MoO3 are liquids at gas turbine operating temperatures and readily flux alumina rich oxide scales.
Author (GRA)

N72-33552# Army Materials and Mechanics Research Center, Watertown, Mass.
A REVIEW OF TEXTURES FOUND IN COMMERCIAL TITANIUM SHEET
Anthone Zarkades and Frank R. Larson Dec. 1971 79 p refs
(DA Proj. 1T0-61102-B-32-A)
(AD-745123; AMMRC-TR-71-60) Avail: NTIS CSCL 11/6

A compilation of data generated during studies concerning the development and characterization of titanium textures is presented. Results include pole figures, elastic and plastic properties in tension, and microstructures. Materials were examined in the as-received condition and in some cases after various heat treatments. A wide range of textures were found for nine titanium alloys including commercially pure, Ti-6Al-4V, Ti-4Al-3Mo-1V, Ti-8Al-1Mo-1V, Ti-6Al-6V-2Sn, Ti-8Mn, Ti4Al-4Mn, Ti-16V-2.5Al, and Ti-7Al-3Mo. The textures found indicate that the technological barrier for application of texture strengthening is due to the lack of established mill procedures for developing the desired texture and not that the specific preferred orientations are unattainable in titanium alloys.
Author (GRA)

N72-33553# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRICAL RESISTANCE AND HEAT CONDUCTIVITY OF CHARGES OF CARBON-CONTAINING FER-

ROMANGANESE AND SILICOMANGANESE
G. U. Nikolaishvili and M. A. Kekelidze 14 Mar. 1972 15 p refs Transl. into ENGLISH from Tr. Akad. Nauk Gruz. SSSR, Inst. Met. (Tiflis), 1968 p 37-46
(AD-745231; FTD-HC-23-2106-71) Avail: NTIS CSCL 11/6

Studies were made of electrical and heat conductivity of the individual components and actual charges of manganese ferroalloys, produced at the Zestafonskiy Ferroalloy Plant - carbon-containing ferromanganese, commercial and saturated silicomanganese. The studies were performed using methods already described, on specially designed installations for determination of the electrical resistance and heat conductivity.
Author (GRA)

N72-33554# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
EFFECT OF GRAIN ORIENTATION ON SUSCEPTIBILITY OF TWO TITANIUM PLATE ALLOYS TO STRESS CORROSION
Charles Edwin Neu 15 Jun. 1972 16 p refs
(AD-745293; NADC-72108-VT) Avail: NTIS CSCL 11/6

The susceptibility to stress corrosion cracking in 3.5 percent sodium chloride solution of Ti-6Al-4V and Ti-6Al-6V-2Sn alloy plates in the annealed and solution treated and aged conditions was determined by tests of notched C-ring specimens with longitudinal, long transverse, and short transverse orientations. Test results indicated that the annealed material of both alloys was more susceptible to cracking in the long transverse direction than in the longitudinal and short transverse directions. In the solution treated and aged material of both alloys the short transverse direction showed slightly less susceptibility to cracking than did the longitudinal and long transverse directions, but the differences were not considered significant. Based on these results a recommendation was made that for plate material of both alloys in air frame design maximum allowable stress be 60% of yield strength in all directions. Author (GRA)

N72-33555# Dow Chemical Co., Midland, Mich.
DEVELOPMENT OF THIN FILM ALUMINUM Final Report, 4 Jan. - 3 Oct. 1971
Charles B. Roberts Nov. 1971 19 p refs
(Contract F33615-71-C-1231; AF Proj. 7633)
(AD-745134; AFML-TR-71-269) Avail: NTIS CSCL 11/3

The goal of the study was to determine the feasibility of using the Dow Electroless Aluminization Process for producing thin, reproducible, uniform aluminum coatings on polyester film with resistances of 10 to 200 ohms per square. An additional objective of Phase I was to determine whether baseline bar patterns could be applied to a polyester film substrate in such a way that pattern edge definition could be evaluated.
Author (GRA)

N72-33556# Battelle Columbus Labs., Ohio.
ELECTRONIC EFFECTS DUE TO MICROINHOMOGENEITIES IN METASTABLE SOLID SOLUTION ALLOYS
Edward W. Collings and Kenneth C. Brog 23 Jun. 1972 93 p refs
(Contract AF-AFOSR-2084-71; AF Proj. 9761)
(AD-745133; AFOSR-72-1279TR) Avail: NTIS CSCL 11/6

Previously obtained data relating to the magnetic and calorimetric properties of the alloy Ti-Mo (10 at.%) was analyzed. It was found, on the basis of that work, that saturated (metastable equilibrium) omega-phase possessed electronic properties comparable to those of pure alpha-Ti. As a result the authors conclude that such omega-phase precipitates are not themselves inherently brittle, as had been initially expected. The results of magnetic and calorimetric studies of the systems Ti-Nb and Ti-V are presented. These data have not yet been subjected to detailed analysis. Finally preprints of papers bearing acknowledgements to OSR, which have been submitted for publication during the year, are attached. Author (GRA)

N72-33557# Battelle Columbus Labs., Ohio. Metals and Ceramics Information Center.
HOT CORROSION IN GAS TURBINES
J. Stringer Jun. 1972 61 p refs
(Contract F33615-71-C-1067)
(AD-745474; MCIC-72-08) Avail: NTIS HC $10.75/MF $10.75. Also available from NTIS HC $18.95/MF $18.95, set of 2 reports as AD-745473-SET CSCL 11/6

The problem of accelerated corrosion of high-temperature gas-turbine alloys in circumstances where sodium chloride or other salts are ingested with the combustion air or in the fuel has been known for many years, and is usually attributed largely to the presence of sodium sulfate, which is either present in the ingested salts or formed by reaction between sodium chloride and sulfur in the fuel. The problem has become more important because of two related developments: the increase in turbine inlet temperatures and the reduction of chromium content in modern superalloys. In the report, a brief outline of the early research is presented, to elucidate the nature of the problem. The thermochemistry of the more important reactions involved is then described. The incidence of the attack in the engine is difficult to predict, and depends very much on the particular alloy. Since a complete fundamental characterization of the process is impossible, there has been considerable interest in testing procedures, and the more important methods are described in the next section. For the same reason, research in the last few years has followed two separate paths: one concerned with phenomenological testing of alloys and the other concerned with the determination of the reaction mechanism. These two types of research are described separately. Author (GRA)

N72-33558# Battelle Columbus Labs., Ohio. Metals and Ceramic Information Center.
OXIDATION OF IRON-NICKEL-AND COBALT-BASE ALLOYS
I. G. Wright Jun. 1972 65 p refs
(Contract F33615-71-C-1067)
(AD-745473; MCIC-72-07) Avail: NTIS HC $10.75/MF $10.75. Also available from NTIS HC $18.95/MF $18.95, set of 2 reports as AD-745473-SET CSCL 11/6

Iron-, nickel-, and cobalt-base superalloys, starting from the compositions Fe-20Cr, Ni-20Cr, and Co-(20 to 25)Cr, have been developed along fundamentally different routes dictated mainly by differing compositional requirements in the search for increased high temperature strength. In Ni-Cr alloys, for example, chromium content has been decreased gradually, and the aluminum content increased to the extent that the alloys now are basically Ni-Cr-Al alloys. In the review current data relating to the oxidation of the relevant pure metals and their binary and ternary alloys are examined first, and then data on oxidation of the more complex engineering alloys are considered. The oxidizing atmosphere is assumed to be oxygen or air, but the mechanisms described generally are applicable to other oxidizing atmospheres. Author (GRA)

N72-33559# National Bureau of Standards, Washington, D.C.
THE ROLE OF PASSIVE FILM GROWTH KINETICS AND PROPERTIES IN STRESS CORROSION SUSCEPTIBILITY Technical Summary Report, 1 Mar. 1971 - 28 Feb. 1972
Jerome Kruger, John R. Ambrose, U. Bertocci, and G. M. Giansky 20 Jun. 1972 86 p refs
(Contract NAonr-18-69; NBS Proj. 312044; NR Proj. 036-082)
(AD-745384; NBS-10876; TSR-3) Avail: NTIS CSCL 11/6

Repassivation kinetic studies of several alloys exposed to environments in which they are susceptible to stress corrosion cracking (SCC) were compared to environments where SCC is not observed using tribo-ellipsometry (a technique for measurement of film growth transients following removal of the oxide by abrasion) and conventional electrochemical techniques.
Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N72-33560*# Gulf General Atomic, San Diego, Calif.
STUDIES OF THERMIONIC MATERIALS FOR SPACE POWER APPLICATIONS Summary Report, 1 Jun. 1968 - 31 Jan. 1971
25 Jan. 1972 232 p refs
(Contract NAS3-11822; Proj. 6082)
(NASA-CR-120839; Gulf-GA-A11049) Avail: NTIS HC $13.75 CSCL 11D

The effect of microstructures of tungsten cladding on the transport rates of carbide fuel components was studied at 2073 K. hyperstoichiometric 90UC-10ZrC containing 4 wt% tungsten was clad with six types of tungsten material of 40 mil thickness. Screening tests of 1000 hours were carried out, and then selected samples were subjected to long-term tests up to 10,000 hours. The results indicate that the microstructures strongly affect the transport rates of carbide fuel components. The conditions for preparing (110) oriented cylindrical chloride tungsten emitters of high vacuum work functions were also investigated. Specimen sets were deposited on fluoride tungsten substrates for evaluating the effects of various deposition parameters on the degree and uniformity of the (110) preferred orientation and the vacuum work function. Long-term tests showed that the high vacuum work function of a cylindrical emitter was stable and the chloride tungsten to fluoride tungsten bond remained in excellent shape after 4850 hours at 2073 K.
Author

N72-33561*# Boeing Co., Seattle, Wash.
APPLICATION STUDY OF FILAMENTARY COMPOSITES IN A COMMERCIAL JET AIRCRAFT FUSELAGE Final Report, Oct. 1971 - Jun. 1972
R. W. Johnson and R. R. June Jun. 1972 123 p refs
(Contract NAS1-11162)
(NASA-CR-112110) Avail: NTIS HC $8.25 CSCL 11D

A study of applications of filamentary composite materials to aircraft fuselage structure was performed. General design criteria were established and material studies conducted using the 727-200 forebody as the primary structural component. Three design approaches to the use of composites were investigated: uniaxial reinforcement of metal structure, uniaxial and biaxial reinforcement of metal structure, and an all-composite design. Materials application studies for all three concepts were conducted on fuselage shell panels, keel beam, floor beams, floor panels, body frames, fail-safe straps, and window frames. Cost benefit studies were conducted and developmental program costs estimated. On the basis of weight savings, cost effectiveness, developmental program costs, and potential for early application on commercial aircraft, the unaxial design is recommended for a 5-year flight service evaluation program.
Author

N72-33562*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A BASIC MODEL FOR ACOUSTIC EMISSION FROM FIBER-REINFORCED MATERIAL
E. Y. Robinson 1 Sep. 1972 6 p refs
(Contract NAS7-100)
(NASA-CR-128344; JPL-TM-33-564) Avail: NTIS HC $3.00 CSCL 11D

The first-order model of acoustic emission from fiber composites, based on filament breaking rates, is cast into a normalized form useful for correlating experimental data. The general features of the normalized model are shown.
Author

N72-33563*# Dow Chemical Co., Midland, Mich.
DEVELOPMENT AND PRODUCTION OF HIGH ALTITUDE DECELERATOR, LIGHTWEIGHT LOW PERMEABILITY BRACE MATERIAL Final Report
[1971] 32 p
(Contract NAS1-10347)
(NASA-CR-111964) Avail: NTIS HC $3.75 CSCL 11D

The following lightweight low permeability samples were produced for evaluation: Mylar/metallizing/Saran coating/adhesive/Mylar; Mylar/metallizing/Saran coating/adhesive/metallizing/Mylar; Mylar/Saran coating/adhesive/metallizing/Mylar; and Mylar/Saran coating/heat resistant coating. Experimental work included selection of adhesive and coating formulations and development of appropriate manufacturing sequence and manufacturing conditions. The 0.00025-in. Mylar can be handled with reasonable care while the 0.00015-in. Mylar was difficult to process. The preferred manufacturing sequence involved metallizing, then Saran coating the metallized film, then adhesive laminating or coating. In laminating, the adhesive should be applied to the heavier web. Control of tension and balance of tensions between webs during lamination are very important. Temperature and air movement used to dry coatings must also be carefully controlled. All four films exhibited very low permeability.
Author

N72-33564*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div.
FIBERGLASS SUPPORTS FOR CRYOGENIC TANKS Final Report
C. W. Keller 10 Oct. 1972 275 p refs
(Contract NAS3-12037)
(NASA-CR-120937; LMSC-D281476) Avail: NTIS HC $15.75 CSCL 11B

Analysis, design, fabrication, and test activities were conducted to develop additional technology needed for application of filament-wound fiberglass struts to cryogenic flight tankage. It was conclusively verified that monocoque cylinder or ogive struts are optimum or near-optimum for the range of lengths and loads studied, that a higher strength-to-weight ratio can be achieved for fiberglass struts than for any metallic struts, and that integrally-wrapped metallic end fittings can be used to achieve axial load transfer without reliance on bond strength or mechanical fasteners.
Author

N72-33565# Bendix Corp., Kansas City, Kans.
REINFORCED COMPOSITE CASE, FY70-4 Quarterly Report
C. U. Fotopoulos Jan. 1972 25 p Revised
(Contract AT(29-1)-613)
(BDX-613-289-Rev) Avail: NTIS

Composite resins and fiberglass cylinders are compression tested to determine if a minimum strength of 75,000 psi can be obtained. Resin systems comprised of Epon 828 and ERL 2256 are compared to DEN 438 and Epon 1031/828 for physical strength properties. The thermal expansion properties for composite resin and fiberglass test samples are determined for a study of material behavior during cure cycles.
Author

N72-33566# Bendix Corp., Kansas City, Kans.
HIGH TEMPERATURE THERMAL INSULATION Quarterly Report
C. U. Fotopoulos Sep. 1971 34 p Revised
(Contract AT(29-1)-613)
(BDX-613-303-Rev) Avail: NTIS

A compression molding technique, used in the manufacture of low density thermal insulation parts from Fiberfrax paper and rigidizers is discussed. Investigations resulted in the selection of a process which produced parts with the specified density without delaminations. Variables in the manufacturing process, and test results, are presented. Load-deflection testing of Fiberfrax samples is also discussed.
Author

N72-33567# Explosives Research and Development Establishment, Waltham Abbey (England).
RESISTANCE OF RUBBERS TO TROPICAL AND TEMPERATE CLIMATES: PART 2: FOUR AND FIVE YEARS' EXPOSURE
A. L. Stokoe Dec. 1971 13 p refs
(ERDE-TN-51-PT-2; BR-28814) Avail: NTIS HC $3.00

Eight rubbers, fluorinated rubber (Viton), neoprene ILA, PVC/nitrile rubber blend, ethylene/propylene/diene terpolymer, natural rubber, neoprene WRT, nitrile rubber, and a polyether urethane (Adiprene L100) have been exposed outdoors in stressed and unstressed conditions in one temperate and three tropical sites. The tensile strength, elongation at break, modulus and hardness have been measured after four and five years' exposure. The results show that ethylene/propylene/diene terpolymer, Viton and PVC/nitrile were the least affected by exposure to temperate and tropical conditions. Author (ESRO)

N72-33568# European Space Research and Technology Center, Noordwijk (Netherlands). Quality and Reliability Div.
GUIDELINES FOR SPACE MATERIALS SELECTION
31 Jul. 1971 61 p refs
(ESRO-PSS-07/QRM-01-Issue-1) Avail: NTIS HC $5.25

A brief review is given of the different classes of materials used in spacecraft manufacture, their chemical nature and physical aspects are described, consideration is given to their processing and assembly methods. Precautions to be taken and materials to be avoided are emphasized for each class. General effects of the space environment are also described. Some individual materials which are suitable for space application under certain conditions are mentioned. Author (ESRO)

N72-33569# European Space Research and Technology Center, Noordwijk (Netherlands). Quality and Reliability Div.
A SCREENING TEST METHOD EMPLOYING A THERMAL VACUUM FOR THE SELECTION OF MATERIALS TO BE USED IN SPACE
10 Sep. 1971 14 p
(ESRO-PSS-09/QRM-02T-Issue-1) Avail: NTIS HC $3.00

The specification concerns the equipment and procedure employed when samples of materials to be used in space are submitted to a screening test under vacuum at 125 C in the presence of a condenser at 25 C. Acceptance limits are given.
Author (ESRO)

N72-33570# European Space Research and Technology Center, Noordwijk (Netherlands). Quality and Reliability Div.
SCREENING TEST METHOD FOR THE SELECTION OF SPACE MATERIALS AND SMALL ASSEMBLIES BY THERMAL CYCLING UNDER VACUUM
Sep. 1971 14 p
(ESRO-PSS-11/QRM-04T-Issue-1) Avail: NTIS HC $3.00

A test method is outlined by which the suitability of materials intended for use in spacecraft manufacture can be assessed under thermal constraints. It also verifies the reliability of small assemblies where there should be no major change in properties, such as undesirable interaction between different materials within the same system, after exposure to temperature cycling under vacuum. Author (ESRO)

N72-33571# Westinghouse Research Labs., Pittsburgh, Pa. Material Sciences Dept.
THE Si3N4-SiC COMPOSITE SYSTEM: EFFECT OF MICROSTRUCTURE ON STRENGTH Interim Technical Report, Feb. 1970 - Feb. 1971
F. F. Lange 15 May 1972 52 p refs
(Contract N00014-68-C-0323)
(AD-743510; Rept-72-9D4-KERAM-R1; ITR-8) Avail: NTIS CSCL 11/4

The Si3N4-SiC composite system was investigated to obtain a better understanding of the effect of microstructure on the three strength controlling factors, viz., fracture energy, elastic modulus and crack size. Three different average particle size dispersions (5 micrometers, 9 micrometers and 32 micrometers) of silicon carbide were used to form three composite series within this system. Within each series, composites were formed containing 0.10, 0.20, 0.30 and 0.40 volume fractions of the dispersed silicon carbide phase. These composites were fabricated by hot-pressing. Author (GRA)

N72-33572# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCERNING THE BASES FOR THE THEORY OF NONLINEAR THERMOVISCOELASTICITY OF SOME POLYMERS
G. A. VanFoFy and V. I. Ozerov 2 Mar. 1972 12 p refs Transl. into ENGLISH from Tepl. Napryazh. v Elementskh Khonstruktsiy (Kiev), no. 8, 1969 p 256-261
(AF Proj. 60403)
(AD-743647; FTD-MT-24-1177-71) Avail: NTIS CSCL 11/9

High-molecular compounds on a base of compositions of epoxy resins with hardeners are used as bonding agents in unhomogeneous materials of the glass-fiber reinforced plastic type. After the solidification of these compounds a polymer is formed with a rigid spatially cross-linked molecular structure.
Author (GRA)

N72-33573# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
INVESTIGATION OF THE INFLUENCE OF STRUCTURE ON CHEMICAL STABILITY AND THERMAL/MECHANICAL SHOCK PROPERTIES OF GLASS LIKE CARBONS Semiannual Technical Report, 2 Nov. 1971 - 1 May 1972
Garth L. Tingey Jun. 1972 40 p refs
(Contract DAHC15-71-C-0248; ARPA Order 1830)
(AD-744383; BNW-211B00718-6/72) Avail: NTIS CSCL 11/2

The report describes results obtained in the following areas: Chemical reactivity and surface area; Work of fracture testing; Thermal shock testing; Thermal conductivity; Heat capacity.
GRA

N72-33574# General Motors Technical Center, Warren, Mich. Materials and Structures Lab.
DYNAMIC PROPERTIES OF POLY (METHYLMETHACRYLATE) (PMMA) PLEXIGLAS Final Report Report
Douglas R. Christman Mar. 1972 48 p refs
(Contract DASA01-68-C-0114)
(AD-743547; MSL-71-24; DNA-2810F) Avail: NTIS CSCL 11/9

Results of an experimental study on the dynamic properties of poly(methylmethacrylate) are presented. Areas studied included uniaxial stress behavior, elastic constants, equation of state, compressive and release wave characteristics, and spall fracture. The material showed viscoelastic response under uniaxial stress conditions, and was strain rate sensitive at 20 and 82 C. The shock wave equation of state was determined up to 20 kbar and showed a complex form in the stress-particle velocity plane that is indicative of non-linear shock velocity-particle velocity behavior. Complete wave profiles were obtained showing compressive wave and release wave development.
Author (GRA)

N72-33575# Army Natick Labs., Mass. Clothing and Personal Life Support Equipment Lab.
FEASIBILITY STUDY TO DETERMINE THE FLUORINE CONTENT IN QUARPEL TREATED FABRICS BY ANALYSIS WITH A 14 MEV NEUTRON ACTIVATION ON SOURCE
Forrest C. Burns (Army Mater. and Mech. Res. Center), Hubertina D. Hogan, and Gil M. Dias Mar. 1972 20 p refs
(AD-744439; C/PLSEL-TS-181; USA-NLABS-TR-72-35-CE) Avail: NTIS CSCL 11/5

A study was initiated on an Army-developed water-and

oil-repellent fabric known as Quarpel containing a fluorochemical component critical to the performance of the finished fabric. To analyze for fluorine content, Quarpel-treated fabrics were subjected to neutron activation. This technique of exposing a fabric to neutrons from a 14 MeV accelerator has not been previously reported. Fluorine content of the treated fabric thus can be measured before and after laundering or dry cleaning and correlated with other physical tests to indicate the durability of the fabric treatment. Author (GRA)

N72-33576# Massachusetts Univ., Amherst. School of Engineering.

STATIC FATIGUE OF SILICATE GLASSES

J. E. Ritter, Jr. and J. Manthuruthil May 1972 31 p refs
(Contract N00014-68-A-0146; NR Proj. 200-016)
(AD-743495; UM-72-5) Avail: NTIS CSCL 11/2

Static fatigue data for fused silica, borosilicate, and soda-lime glasses in both the abraded and pristine state are presented. Static fatigue sensitivity depends markedly on the surface treatment of the glass (abraded vs. pristine) but little, if any, on glass composition. These results are analyzed in terms of the stress corrosion theory of Charles and Hillig and the atomistic, probability theory of Cox. Neither of these two theories can successfully account for the static fatigue behavior of silicate glasses. Author (GRA)

N72-33577# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

USE OF KARBOST IN PARONIT PRODUCTION

I. M. Kanevskii, R. I. Feldman, and Ye. Z. Shossel 4 Apr. 1972 7 p Transl. into ENGLISH from Kauchuk i Rezina (Moscow), v. 29, no. 1, 1970 p 43-44
(AD-743675; FTD-HC-23-1950-71) Avail: NTIS CSCL 11/10

Karbost (a by-product of wood pulping industry) was used for filling Paronit (a sealing compound) based on rubber SKS-30. The new filler has low thermal conductivity coefficient and high electrical resistance (60,000 ohm cm at 20 degrees). Paronit filled with Karbost had greater tensile strength at break than Paronit containing graphite. Author (GRA)

N72-33578# Carnegie-Mellon Univ., Pittsburgh, Pa. Metals Research Lab.

OPTIMIZATION OF THE RANGE OF ELASTIC BEHAVIOR OF UNIDIRECTIONAL COMPOSITES BY PRESTRAINING

Richard W. Heckel, Richard J. Zaehring (Drexel Univ.), and Harvey P. Cheskis (Olin Mathieson Chem. Corp., New Haven, Conn.) Jun. 1972 30 p refs
(Contract N00014-67-A-0406-0002; NR Proj. 031-714)
(AD-744972; TR-5) Avail: NTIS CSCL 11/4

The effect of tensile prestrain on the stage I tensile yield stress was studied both analytically and experimentally for composites whose stress-strain curves obey the rule of mixtures. The mathematical analysis provides a means for calculating the optimum amount of prestrain, the residual stresses (in the direction of the fibers) in the matrix and fiber materials after unloading from the prestraining, and the stage I yield stress in the composite after the prestrain treatment. It is shown that the improvement in stage I yield stress by prestraining is due to the development of negative residual stresses in the matrix. The stage I yield stress in composites with negligible residual stresses in the as-fabricated condition can usually be improved by a factor of two by prestraining; the amount of improvement is even greater if the as-fabricated composites have the usual state of residual stress, i.e., tension in the matrix. Author (GRA)

N72-33579# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.

RESEARCH ON THE PHENOMENOLOGICAL AND MOLECULAR ASPECT OF THE MECHANICAL RESPONSE OF ELASTOMERIC MATERIAL, 1960-1970 Final Report

Frederick R. Eirich and Jerome M. Klosner Apr. 1972 25 p refs
(Contracts N00014-67-A-0438-0010; Nonr-839(32); NR Proj. 064-457)
(AD-745303; PIBAL-72-15) Avail: NTIS CSCL 11/10

The studies summarized in the report are the result of research concerned with the mechanical behavior of elastomeric materials in phenomenological and molecular terms, with special attention to polar rubbers, to non-ideal responses and to strain induced changes in state. The work was performed during the past 11 years. The report summarizes work on physico-chemical structure, experimental and theoretical high elasticity, rate effects, and continuum mechanics. GRA

N72-33580# Army Foreign Science and Technology Center, Charlottesville, Va.

DURABILITY INCREASE IN GRAPHITE REINFORCED YARN

E. B. Trostyanskaya and L. P. Kobets 17 Apr. 1972 11 p refs Transl. into ENGLISH from Russian report
(AD-745387; FSTC-HT-23-717-71) Avail: NTIS CSCL 11/5

The possibility of graphite-containing yarn strength increase is described. Incorporation of organic polymers into the yarn is described. Author (GRA)

N72-33581# Catholic Univ. of America, Washington, D.C. School of Engineering and Architecture.

STRESS FIELD IN A SPHERE SUBJECTED TO LARGE DEFORMATIONS

T. L. Chen and A. J. Durelli Jun. 1972 39 p refs
(Contract N00014-67-A-0377-0011)
(AD-745338; Rept-30) Avail: NTIS CSCL 11/9

The previously obtained strain fields in a sphere subjected to large deformations were converted into stress fields by using two different approaches: the strain-energy function and the concept of natural stress. Complete determination of stresses on the equatorial plane and on a plane parallel to it are given. The deviatoric stresses on the equatorial plane and the maximum shear stresses along the vertical axis of the sphere were determined using both approaches. The simplicity of the theory using the natural stress concept offers a good alternative for materials exhibiting linear relationship between natural strain and natural stress. Author (GRA)

N72-33582# Army Foreign Science and Technology Center, Charlottesville, Va.

CHEMICAL STRUCTURE AND TEMPERATURE CHARACTERISTICS OF POLYMERS

Vasilii Vladimirovich Korshak 14 Jun. 1972 563 p refs Transl. into ENGLISH of the book "Khim. Stroenie i Temperaturnye Kharakteristik i Polimerov" Moscow, 1970 390 p
(AD-745550; FSTC-HT-23-1145-72) Avail: NTIS CSCL 11/9

Thermal stability of polymers is one of the most urgent problems in polymer chemistry stemming from the growth of modern technology that demands materials capable of functioning for long periods of time at elevated temperatures. The book sums up data on the relationships between heat resistance and thermostability of polymers and their chemical structure. Special emphasis is given to those features of polymer structure that can promote an increase in the thermal characteristics of polymers. In the first part, the currently available data is analyzed that characterize the dependence of the heat resistance of polymers on their chemical structure. The second part contains material that describes the interrelationship that holds between thermostability of polymers and their chemical structure. The authors do not set out to furnish exhaustive information on all representatives of individual polymer classes, and therefore the material given in the tables is only illustrative, confirmatory of the principles examined in the corresponding section of the book. Author (GRA)

N72-33583# Texas A&M Univ., College Station. Mechanics and Materials Research Center.

ON THE THERMAL DIFFUSIVITY OF FILLED ELASTOMERS

R. A. Schapery and R. E. Martin Jun. 1972 60 p refs
(Contract N00014-68-A-0308-0003; NR Proj. 064-520)
(AD-745327; MM-72-2; TR-1) Avail: NTIS CSCL 11/4

The influence of temperature and strain on the thermal diffusivity of particulate-filled elastomers is studied analytically and experimentally. Theoretical bases for the separate effects of temperature history on specific heat, especially in the neighborhood of the glass-transition temperature, and strain-induced vacuole dilatation on the conductivity, are first described. Included is a comparison of the specific heat based on kinetic theory with new results from the theory of irreversible thermodynamics. An experimental investigation on the diffusivity of two different solid propellants is described. Finally, theoretical and experimental results are shown to be in reasonably good agreement over the entire experimental temperature range, -320 F to 140 F.
Author (GRA)

N72-33584# United Aircraft Corp., East Hartford, Conn.
THE EFFECT OF EUTECTIC MICROSTRUCTURES OF THE MECHANICAL PROPERTIES OF CERAMIC OXIDES
Technical Report, 1 Feb. 1971 - 31 Jan. 1972
Charles O. Hulse and John A. Batt Jun. 1972 42 p refs
(Contract N00014-69-C-0073; NR Proj. 032-516)
(AD-745328; UARL-L910803-7; TR-3) Avail: NTIS CSCL 11/2

The report reviews the third year of a research investigation directed toward an examination of the properties of oxide-oxide eutectics unidirectionally solidified to form composite microstructures, and describes the preparation and mechanical properties of several unidirectionally solidified, high melting point systems.
Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N72-33585 Engineering Sciences Data Unit, London (England).
SOLUTION OF ORDINARY LINEAR DIFFERENTIAL EQUATIONS BY THE LAPLACE TRANSFORM METHOD
Aug. 1970 13 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-69025) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A working scheme for solving ordinary linear differential equations with constant coefficients by means of the Laplace transform is presented. The transform reduces such an equation to a simple algebraic one from which the required solution is found by reference to tables of transforms. Thus with its use the only mathematical knowledge required to solve an ordinary linear differential equation with constant coefficients is the manipulation of algebraic equations.
Author

N72-33586*# National Aeronautics and Space Administration, Washington, D.C.
THE METHOD OF LYAPUNOV ROTATIONAL FUNCTIONS FOR FINDING OSCILLATING CONDITIONS
V. V. Nemytskiy Jun. 1972 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 97, no. 1, 1954 p 33-36
(NASA-TT-F-14428) Avail: NTIS HC $3.00 CSCL 12A

Closed region G of an n-dimensional space toroid is discussed. It may be obtained from a topological torus or from the spherical neighborhood of a circle T by means of the exclusion of not more than a finite number of regions entirely embedded in T. A toroidal area which does not coincide with the torus is the space enclosed between two torus surfaces. To each point of a toroidal region may be ascribed an angular coordinate which determines the meridional surface upon which this point lies.
Author

N72-33587# Rice Univ., Houston, Tex. Dept. of Mechanical and Aerospace Engineering and Materials Science.
METHOD OF DUAL MATRICES FOR FUNCTION MINIMIZATION
H. Y. Huang 1972 33 p refs
(Contract NSF GP-32453)
(AAR-88) Avail: NTIS HC $3.75

The method of dual matrices, which bypasses the one-dimensional search for the stepsize, is characterized by employing two matrices at each iteration. One matrix is such that a linearly independent set of directions can be generated, regardless of the stepsize employed. The other matrix is such that, at the point where the first matrix fails to yield a linearly independent gradient, it generates a displacement leading to the minimal point. For a quadratic function, it is proved that the minimal point is obtained at most $n + 1$ iterations, where n is the number of variables in the function. Since the one-dimensional search is not needed, the total number of gradient evaluations for convergence is at most $n + 2$. This represents a saving on the total computational effort versus $2n + 1$ gradient evaluations required by the conventional quadratically convergent algorithms. Three algorithms of the method are presented. A reverse algorithm, which permits the use of only one matrix, is also given. Notes pertaining to the applications of this method to the minimization of a quadratic function and a nonquadratic function are included.
Author

N72-33588# Rice Univ., Houston, Tex. Dept. of Mechanical and Aerospace Engineering and Materials Science.
NUMERICAL EXPERIMENTS ON DUAL MATRIX ALGORITHMS FOR FUNCTION MINIMIZATION
H. Y. Huang and J. P. Hambliss 1972 33 p refs
(Grant NSF GP-32453)
(AAR-89) Avail: NTIS HC $3.75

Four algorithms of dual matrices for function minimization introduced in N72-33587 are tested through several numerical examples. Three quadratic functions and five nonquadratic functions are investigated. For quadratic functions, the results show that convergence is achieved in at most $n + 1$ iterations, where n is the number of variables. Since the one-dimensional search is not needed in these algorithms, the total number of gradient evaluations for convergence is at most $n + 2$. This represents a saving on the gradient evaluations versus $2n + 1$ required by conventional quadratically convergent algorithms. For nonquadratic functions, the results show that these algorithms are very stable and efficient. Also, the effects of the stepsize factor on these algoritms are investigated.
Author

N72-33589# Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft. Data Processing Dept.
DELFT. A PROGRAMME SYSTEM FOR SURFACE APPROXIMATION
E. R. Bosman, D. Eckhart, and K. Kubik Aug. 1971 23 p refs
Avail: NTIS HC $3.25

A program system for the computation of a surface through a set of given data points is described. The program system can be applied to all those fields of science, where a surface has to be approximated, such as geology, geochemistry, cartography, engineering, and medicine. The program system, named Delft according to its place of origin, consists of a set of different modules for the computation of a surface, which have the following common properties. (1) Very flexible functions are used to analytically represent the surface. (2) The genesis of the physical surface under consideration can be modelled in the computation. The basic principles of the program modules are outlined followed by a detailed description of the computational algorithms and numerical examples.
Author (ESRO)

N72-33590# Rijkswaterstaat, The Hague (Netherlands). Data Processing Dept.
EFFICIENT METHODS FOR STRIP AND BLOCK ADJUSTMENT
K. Kubik Aug. 1971 18 p refs Sponsored by Neth. Interdept.

Working Group on the Appl. of Remote Sensing
Avail: NTIS HC $3.00

The theory and computational algorithms are outlined for a number of methods for strip and block adjustments. The basic concept underlying the proposed method is that of the approximation of strip deformation by piecewise polynomial functions. The mathematical formulation of the piecewise polynomials makes adjustment methods based on it compare very favourably with alternative methods. Author (ESRO)

N72-33591# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE EXPECTED JUSTIFICATION OF FORECAST IN THE SYSTEM OF QUADRATIC DISCRIMINANT ANALYSIS
M. G. Ter-Mkrtchyan 10 Feb. 1972 38 p refs Transl. into ENGLISH from Gidrometeorologicheskii Nauchn. Issled. Tsentr SSSR, Tr. (USSR), no. 44, 1969 p 82-106
(AD-743672; FTD-MT-24-1658-71) Avail: NTIS CSCL 12/1

Today methods of mathematical statistics are penetrating meteorology increasingly more. Specifically for forecasting meteorological elements both parametric and nonparametric discriminant analysis methods are used. In this report a study was made of the distribution of a quadratic discriminant function on the assumption of normalcy of the initial general sets. The corresponding characteristic functions were determined. In some cases precise formulas are given for the probability density function; in other cases approximate expressions are proposed. GRA

N72-33592# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
ON THE EVALUATION OF COMPLEX ERROR FUNCTION Interim Report
K. S. Nagaraja May 1972 29 p refs
(AF Proj. 7064)
(AD-744846; ARL-72-0074) Avail: NTIS CSCL 12/1

The complex error function appears quite often in many physical and engineering problems. For example, plasma dispersion in rarefied media involves such functions. It is quite important to establish an algorithm to evaluate the complex error function. The zeros of the function are also tabulated. An effective method based on complex analysis is presented in the report and some useful results are tabulated. Author (GRA)

N72-33593# Purdue Univ., Lafayette, Ind. Automatic Control Center.
IDENTIFICATION OF PARAMETERS IN NONLINEAR BOUNDARY CONDITIONS OF DISTRIBUTED SYSTEMS WITH LINEAR FIELDS
E. Dawson Ward and Raymond E. Goodson Jul. 1972 12 p refs
(Contract N00014-67-A-0226-0012; NR Proj. 041-423)
(AD-744696; ACC-72-7; TR-6) Avail: NTIS CSCL 12/1

A method is presented for the formulation of unknown parameters in nonlinear boundary conditions in distributed parameter dynamic systems. In contrast to other available techniques, this method requires only as many measurement sensors within the field as there are unknown boundary conditions. Results are presented for simulated data from an example of heat conduction with radiation boundary and for experimental data from a cantilever beam with a nonlinear moment at the boundary. The method may be applied to partial differential equations which are linear, one-dimensional, and have known time invariant coefficients. The nonlinear boundary conditions are specified up to a set of unknown constant parameters which appear linearly in the boundary conditions. Author (GRA)

N72-33594# Naval Weapons Center, China Lake, Calif. Research Dept.
A FORTRAN PROGRAM FOR TRAJECTORY OPTIMIZATION USING THE EPSILON METHOD
E. Y. Mikami Jul. 1972 26 p refs
(AD-744940; NWC-TP-5369) Avail: NTIS CSCL 12/1

A FORTRAN program for solving optimal control problems using the epsilon method is given. Problems are restricted to those having a scalar bounded control, a cost functional of the form G(X(t sub f),t sub f), and a growth restriction on the dynamic function. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also 13 Geophysics, and 30 Space Sciences.

N72-33595 Koninklijk Nederlands Meteorologisch Instituut, The Hague.
NETHERLANDS CLIMATALOGICAL ATLAS [KLIMMAATATLAS VAN NEDERLAND]
1972 58 p refs In DUTCH and ENGLISH
Copyright. Avail: Issuing Activity

Maps are presented which give the spatial and temporal variability in the climatological elements. In general the mean values of the elements are presented with the help of isolines. The specific data include atmospheric pressure, wind speed and rose diagrams, temperature, precipitation, snow cover, evaporation precipitation surplus, sunshine, cloudiness, fog, humidity, thunder, and circulation types. Daily, monthly, and annual data are presented. N.E.N.

N72-33596 National Lending Library for Science and Technology, Boston Spa (England).
A STATISTICAL INVESTIGATION OF ASTROCLIMATIC AND METEOROLOGICAL CHARACTERISTICS AND AN ESTIMATE OF THE POSSIBILITY OF FORECASTING SEEING CONDITIONS AT THE BTA SITE
O. B. Vasilev and N. F. Nelyubin Jul. 1972 14 p refs Transl. into ENGLISH from Izv. Spets. Astrofiz. Observ. (USSR), v. 3, 1971 p 26-35
(NLL-RTS-7355) Avail: Natl. Lending Library, Boston Spa, Engl.: £11.40; 5 NLL photocopy coupons

A statistical study was carried out on a series of observations made during the Zelenchuk expedition (1961 to 1966) of the Main Astronomical Observatory of the Academy of Sciences, U.S.S.R. The features studied are shown to have periodic components. No clear correlation is found between visibility conditions and the meteorological factors taken separately. A multifactorial variance analysis was done which enabled a relationship to be established between seeing conditions and the full set of meteorological factors and their derivatives. A linear representation of the turbulence angle by the factors and derivatives is obtained. The possibility is discussed of statistical forecasting of visibility conditions by the use of a frequency spectrum as well as the linear angle representation. Author

N72-33597 National Lending Library for Science and Technology, Boston Spa (England).
CRITERIA FOR ANALOGY BETWEEN HYDROMETEOROLOGICAL FIELDS
D. A. Ped [1972] 11 p refs Transl. into ENGLISH from Tr. Gidrometeorol. Nauchn.-Issled. Tsentr. SSSR (Leningrad), no. 64, 1970 p 103-111
(NLL-M-22671-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Various methods of developing analog models of hydrometeorological fields are reviewed. The methods are primarily qualitative or quantitative, using nondiscreter fields or discrete elements. It is pointed out that investigators recently use coefficients in the expansions of fields in terms of different kinds of functions rather than point information. In conjunction with the field analogs, other parameters are introduced, such as the

degree of anomaly of the hydrometeorological fields in a particular month, and the degree of similarity given by the differences between coefficients in the expansions of the fields. As an example, analogs for the fields of monthly mean air temperature anomalies in the Soviet Union in winter are developed. N.E.N.

N72-33598 International Geophysical Year World Data Center A, Asheville, N.C.
HIGH ALTITUDE METEOROLOGICAL DATA, VOLUME 7, NO. 11, NOVEMBER 1970
1972 224 p
Avail: SOD $3.00

Wind and temperature measurements from all available meteorological sounding rocket firings are presented, along with computed values for pressure, density, and speed of sound. Local radiosonde observations nearest the time of firing are included. Statistical tables and graphs of current month means and standard deviations for all parameters with long-term means are also presented. Author

N72-33599 Engineering Sciences Data Unit, London (England).
ATMOSPHERIC DATA FOR PERFORMANCE CALCULATIONS. ADDENDUM: HEIGHT IN FEET, DATA IN SI UNITS
May 1972 13 p Sponsored by Roy. Aeron. Soc.
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The atmospheric characteristics, such as temperature, pressure, and density, are tabulated in SI units increments in height of 200 ft from -2000 ft to 105,000 ft. N.E.N.

N72-33600*# South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
POTENTIAL VALUE OF SATELLITE CLOUD PICTURES IN WEATHER MODIFICATION PROJECTS
K. R. Biswas May 1972 35 p refs
(Grant NGL-42-001-004)
(NASA-CR-128321; R-72-9) Avail: NTIS HC $3.75 CSCL 04B

Satellite imagery for one project season of cloud seeding programs in the northern Great Plains has been surveyed for its probable usefulness in weather modification programs. The research projects and the meteorological information available are described. A few illustrative examples of satellite imagery analysis are cited and discussed, along with local observations of weather and the seeding decisions made in the research program. This analysis indicates a definite correlation between satellite-observed cloud patterns and the types of cloud seeding activity undertaken, and suggests a high probability of better and/or earlier decisions if the imagery is available in real time. Infrared imagery provides better estimates of cloud height which can be useful in assessing the possibility of a hail threat. The satellite imagery appears to be of more value to area-seeding projects than to single-cloud seeding experiments where the imagery is of little value except as an aid in local forecasting and analysis. Author

N72-33601# National Weather Service, Silver Spring, Md.
NUMERICAL WEATHER PREDICTION ACTIVITIES: NATIONAL METEOROLOGICAL CENTER, FIRST-HALF 1972
Sep. 1972 46 p refs
Avail: NTIS HC $4.50

The numerical weather prediction activities are summarized of the National Meteorological Center (NMC) for the first half of 1972. During that period, the time step of the coarse-mesh six-layer primitive equation (6L PE) model was increased from 10 to 20 minutes, adaptation of the Air Force Global Weather Central planetary boundary layer model to the NMC environment was completed for testing, and operational testing of the hemispheric eight-layer primitive equation (8L HEM) model was begun. Also included are summaries of recent developments in data automation and verification statistics for the 6L PE model. Author

N72-33602# Army Cold Regions Research and Engineering Lab., Hanover, N.H. Research Div.
[PROPERTIES OF SNOW, ICE; AND FROZEN GROUND, AND INTERRELATIONSHIP WITH METEOROLOGICAL PHENOMENA] Quarterly Progress Report, Jan. - Mar. 1972
Mar. 1972 29 p refs
Avail: NTIS HC $3.50

Continuing research in terrestrial sciences and climatology of cold regions is reported. The military engineering tasks include research in snow, ice, and frozen soil; general engineering support in cold environments; mobility and environmental research in cold regions; in-house laboratory independent research; and related work. N.E.N.

N72-33603# Army Cold Regions Research and Engineering Lab., Hanover, N.H. Research Div.
[PROPERTIES OF SNOW, ICE, AND FROZEN GROUND, AND INTERRELATIONSHIP WITH METEOROLOGICAL PHENOMENA] Quarterly Progress Report, Apr. - Jun. 1972
Jun. 1972 29 p refs
Avail: NTIS HC $3.50

Continuing research in terrestrial sciences and climatology of cold regions is reported. The military engineering tasks include research in snow, ice, and frozen soil; general engineering support in cold environments; mobility and environmental research in cold regions; in-house laboratory independent research; and related work. N.E.N.

N72-33604# National Oceanic and Atmospheric Administration, Las Vegas, Nev. Air Resources Lab.
WEATHER PREDICTIONS AND SURFACE RADIATION ESTIMATES FOR THE SULKY EVENT Final Report
28 Apr. 1972 39 p ref
(AEC Order SF-54-351)
(PNE-714-F) Avail: NTIS

The activities performed by the Weather Bureau Research Station, Las Vegas, Nevada in support of Project Sulky are described. The objectives and functions of the Weather Bureau in the Sulky experiment are outlined. The meteorological facilities and procedures are discussed along with the meteorological forecasts and radiation estimates which were issued. These forecasts are compared with meteorological and radiological data collected during and after the detonation of Sulky. The post-shot meteorological trajectories are described and the results of a tetroon tracking experiment run in conjunction with the Sulky shot are presented. Author (NSA)

N72-33605# Institut Royal Meteorologique de Belgique, Brussels.
THE WEATHER DURING 1971 [LE TEMPS EN 1971]
R. Sneyers 1972 52 p In FRENCH
(Publ-Ser-B-66) Avail: NTIS HC $4.75

A climatological study in Belgium for the period December 1970 through November 1971 is presented with accompanying graphical and tabular data. Among the topics discussed are the general atmospheric situation, winds, haze and insolation, air humidity, and precipitation. The predominant influences characterizing each month are also described. Author (ESRO)

N72-33606# Bonn Univ. (West Germany). Inst. fuer Meteorologie.
A PROPOSED MODEL FOR GENERAL CIRCULATION OF THE ATMOSPHERE AND SIMULATION OF CLIMATOLOGICAL STRUCTURES [ENTWURF EINES MODELLS ZUR ALLGEMEINEN ZIRKULATION DER ATMOSPHAERE UND SIMULATION KLIMATOLOGISCHER STRUKTUREN]
Frank Schmidt 1971 72 p refs In GERMAN; ENGLISH

summary Sponsored in part by Deut. Forschungsgemeinschaft (Bonn-MI-16-1971) Avail: NTIS

A five-level general atmospheric circulation model for climatological simulation is presented. The climatological parameters taken into account are: the distribution of land and sea; meridional temperature gradients due to solar energy absorbed at the surface and long term oceanic heat storage; and mountain reliefs on the continents. A three-layer resolution is introduced in order to represent the coupling between the lower boundary and the atmosphere through long-wave radiation and heat convection. The use of Legendre's spherical harmonics and double Fourier functions as a computation basis is described.
Author (ESRO)

N72-33607# Bonn Univ. (West Germany). Inst. fuer Meteorologie.
TROPICAL CIRCULATION PATTERN
Hermann Flohn 1971 61 p refs
(Bonn-MI-15-1971) Avail: NTIS HC $5.25

The longitudinal differentiation of the tropical circulation patterns based on actual data and heat budget considerations are outlined. Among the topics discussed are Hadley and anti-Hadley cells, cold sources at the equator, interaction between tropical and extratropical circulation patterns and the ultra-long wave concept. Author (ESRO)

N72-33608# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN, MISSILE NO. 1868, ROUND NO. 619 AML (28 APRIL 1972) Meteorological Data Report
Apr. 1972 32 p
(DA Proj. 1T6-65702-D-127)
(AD-743848; DR-709) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John, Missile Number 1868, Round Number 619 AML, are presented in tabular form. Author (GRA)

N72-33609# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12808 LANCE, MISSILE NO. 2166, ROUND NO. 158 SPT (19 MAY 1972) Meteorological Data Report
May 1972 51 p
(DA Proj. 1T6-65702-D-127)
(AD-743847; DR-713) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12808 Lance, Missile Number 2166, Round Number 158 SPT, are presented in tabular form. Author (GRA)

N72-33610# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13401 HONEST JOHN, MISSILE NO. 2649, ROUND NO. 621 RML Meteorological Data Report
May 1972 40 p
(DA Proj. 1T6-65702-D-127)
(AD-743846; DR-711) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13401 Honest John, Missile Number 2649, Round Number 621 RML, are presented in tabular form. Author (GRA)

N72-33611# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODEL OF THE ZONAL CIRCULATION OF THE ATMOSPHERE ON A PLANETARY SCALE UP TO AN ALTITUDE OF 200 KM
P. B. Belich, I. V. Buraeva, L. A. Ryazanova, and B. N. Trubnikov 17 Feb. 1972 24 p refs Transl. into ENGLISH from Tr. Tsentr. Aerolog. Observ. (Moscow), no. 81, 1969 p 59-71
(AD-743670; FTD-MT-24-1653-71) Avail: NTIS CSCL 04/2

The calculation of the hemiempirical model of the atmospheric zonal circulation up to 200 km is considered. The migration of the maximum wind regions during summer, winter and transitional seasons in the northern and southern hemispheres is investigated. The comparison of the calculation model with the real processes taking place in the atmosphere confirms its acceptability.
Author (GRA)

N72-33612# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 03702 HONEST JOHN, MISSILE NO. 1879, ROUND NO. 622 AML Meteorological Data Report
May 1972 31 p
(DA Proj. 1T6-65702-D-127)
(AD-743845; DR-712) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 03702 Honest John, Missile Number 1879, Round Number 622 AML, are presented in tabular form. Author (GRA)

N72-33613# Environmental Technical Applications Center (Air Force), Washington, D.C.
AN INVESTIGATION INTO THE PROPER SPATIAL AND TEMPORAL FREQUENCY OF THE METEOROLOGICAL ROCKETSONDE NETWORK
Walter I. Christensen, Terrell D. McCorrey, and Ernest Fisher Jun. 1972 25 p refs
(AD-744824; USAFETAC-TN-72-6) Avail: NTIS CSCL 04/2

The study presents a brief history of the rocketsonde network and lists the present and anticipated requirements for rocketsonde data. The authors present their views for an optimum network which would satisfy the spatial and temporal requirements necessitated by the expanding need for timely and accurate rocketsonde observations. Author (GRA)

N72-33614# Naval Weather Service Command, Washington, D.C.
ATLANTIC TROPICAL CYCLONE VECTOR MEAN CHARTS
Harold L. Crutcher (Natl. Climatic Center) and Frank T. Quinlan (Natl. Climatic Center) Aug. 1971 58 p refs
(AD-744915) Avail: NTIS CSCL 04/2

The paper presents resultant directions and distances for tropical cyclone movements in the Atlantic, Caribbean and Gulf of Mexico. Charts present the movement for separate five-degree latitude-longitude areas, for five seasons and for six time intervals. In addition, the charts provide sufficient information to allow the user to construct 0.90 probability ellipses.
Author (GRA)

N72-33615# Weather Wing (4th), Ent AFB, Colo.
APPLYING A WINDOW PANE TECHNIQUE TO THE COLORADO SPRINGS SNOW STUDY
Robert C. Sabin Jan. 1972 26 p
(AD-743301; Rept-4WW-72-1) Avail: NTIS CSCL 04/2

The paper supplements 4 WWg Technical Paper 70-5, Predicting Heavy Snowfall for Colorado Springs Based on Computer Derived Synoptic Map Types (AD 718422). The success of the map typing technique described in 4 WWTP 70-5 depends upon the size of the area or window selected for typing. In the Colorado Springs snow study the map size chosen covered an area of 10 degrees latitude and 15 degrees longitude. Since this is approximately the size of a synoptic scale disturbance, the map types which were developed gave a good indication of the general circulation pattern required for heavy snow. However, where heavy snowfall is influenced by the local area flow superimposed upon the broader scale features, it is possible that the circulation pattern could correlate highly with a snow type and still not produce the forecast snowfall. The paper describes an attempt to zero-in on the small scale circulation by correlating only one corner of the large window. Author (GRA)

N72-33616# Naval Postgraduate School, Monterey, Calif.
COMPATIBILITY OF AN AIRCRAFT AND RAWINSONDE MEASUREMENTS M.S. Thesis

Denis G. Taipale Mar. 1972 93 p refs
(AD-743710) Avail: NTIS CSCL 04/2

Investigation of data obtained by aircraft during Project Rough Rider '71 reveals that aircraft navigation is unsatisfactory for mesoscale research on the convective cell scale. The established method for re-navigating the flights is modified to yield navigation errors of less than 0.1 nautical mile for most tracks when compared with entries in the navigator's log. It is shown that the corrections required are dependent on the height of the aircraft above the terrain, terrain slope and wind. Meteorological parameters obtained from aircraft measurements are compared with rawinsonde measurements. These comparisons show that if appropriate corrections are applied, the data are useful for extending rawinsonde networks and defining spatial gradients of parameters between stations. Recommendations for determination of correction factors and suggestions for further research are made. Author (GRA)

N72-33617# Naval Postgraduate School, Monterey, Calif.
FINE STRUCTURE MEASUREMENT OF TEMPERATURE AND MOISTURE OVER THE MONTEREY BAY M.S. Thesis
Lundy Ray Colvert Mar. 1972 105 p refs
(AD-743702) Avail: NTIS CSCL 04/2

Temperature, pressure and moisture measurements were made from the surface to 2,000 feet over the Monterey Bay during several different synoptic conditions. Data collection was made from ground level and a helicopter; however, most of the data were collected from the helicopter due to the height limitation of the ground equipment. Cross sections of temperature and moisture were drawn over a wide range of fog conditions. The profiles were used in conjunction with the broad synoptic wind and visibility as a basis for the conclusions stated. Author (GRA)

N72-33618# Air Force Global Weather Central, Offutt AFB, Nebraska.
AFGWC AIR STAGNATION MODEL
Richard L. Daye 15 May 1972 15 p refs
(AD-743304; AFGWC-TN-72-6-1) Avail: NTIS CSCL 04/2

The Air Stagnation Model (ASM) developed at the Air Force Global Weather Central (AFGWC) is designed to provide air stagnation data to Air Force installations located overseas where mesoscale data are available. Parameters are derived from the AFGWC Boundary Layer Model (BLM) data and the AFGWC Meso-Scale Prediction Model data. Precipitation forecasts from the Macro-Scale Cloud Module (MSC) are also used. Since the BLM forecasts are only available through 24 hours, the 36-hour outlook uses data from the AFGWC Macro-Scale Baroclinic Prediction Model, the MSC and the 1000-mb Prognostic Model. The techniques used in the ASM are similar to those used by the National Weather Service (NWS). The air stagnation data include mixing depth, transport wind in the mixing layer, ventilation value in the mixing layer, meteorological stagnation index (MSI), times of maximum and minimum MSI and the maximum and minimum MSI. Author (GRA)

N72-33619# Air Force Global Weather Central, Offutt AFB, Nebraska.
A MODIFIED UPSTREAM DIFFERENCING TECHNIQUE FOR SOLVING THE ADVECTION EQUATION
Lynn L. LeBlanc 1 Apr. 1972 51 p refs
(AD-743302; AFGWC-TM-72-1) Avail: NTIS CSCL 04/2

A scheme for numerical modelling of advection of meteorological parameters has been developed and is now used in operational models of the AFGWC. In this scheme, new values are determined at each time step for each grid point of the prediction matrix by first determining the upstream trajectory position at the previous time step and the corresponding parametric values, and then modifying the grid point values. This quasi-Lagrangian advection scheme, which is inherently computationally stable, allows use of any reasonable time step and almost total elimination of artificial smoothing. This technique effects preservation of tight gradients and flow patterns with minimal distortion through the forecast period, as well as more realistic movement and retention of extreme parametric values of analyzed features. Author (GRA)

N72-33620# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
AN ANALYSIS OF WINDS DERIVED FROM UPWIND RAWINSONDE RELEASES Environmental Research Papers
Gary J. Thompson, Peter A. Giorgio, and Samuel Penn 14 Mar. 1972 16 p refs
(AF Proj. 8626)
(AD-743326; AFCRL-72-0189; AFCRL-ERP-396) Avail: NTIS CSCL 04/2

Rawinsonde balloons were tracked simultaneously by GMD-1 equipment from the release site and from a site 58 miles downwind. The derived winds are analyzed for three sequential soundings. The results show that the upwind release method (downwind tracking) provides mesoscale winds aloft under conditions prohibitive to conventional tracking methods. Tracking errors for both release methods are analyzed. Large-scale bias errors caused by anomalous propagation appear in the conventional tracking data and produce erroneous wind oscillations which are repeatable in sequential soundings. An analysis of the random error component shows a critical elevation tracking angle of 10 degrees for conventional observations and 9 degrees for the upwind release method. Author (GRA)

N72-33621# Naval Weather Service Command, Washington, D.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS. JAPANESE AND KOREAN COASTAL MARINE AREAS. VOLUME 6: AREA 16, SASEBO; AREA 17, INLAND SEA; AREA 18, MATSUE
May 1972 475 p
(AD-743944) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from tape data Family 11 (TDF-11), Marine Surface Observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of coastal marine summaries. The areas discussed in the report include Sasebo, Inland Sea and Matsue, Japan. GRA

N72-33622# Naval Postgraduate School, Monterey, Calif.
INVESTIGATIONS ON THE TEMPERATURE FLUCTUATIONS AND INCIDENCE OF MICRO-THERMALS IN THE AIR ADJACENT TO NATURAL WATER WAVES M.S. Thesis
Gordon Wayne Safley Mar. 1972 84 p refs
(AD-745171) Avail: NTIS CSCL 04/2

Temperature, wind and wave data observed over Lake Michigan were analyzed to yield results on properties of sensible heat transfer in the near-surface layer. Significant features in the overwater data are associated with positive temperature fluctuations which appear as ramps (micro-thermals) in continuous traces. Objective methods based on the distinctive shape of the ramps were used to identify the occurrences of the micro-thermals. Author (GRA)

N72-33623# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A PHYSICAL MODEL OF CLEAR-AIR TURBULENCE
N. Z. Pinus 4 Feb. 1972 20 p refs Transl. into ENGLISH from Meteorol. Gidrol. (USSR), no. 6, 1971 p 57-66
(AD-743691; FTD-MT-24-1726-71) Avail: NTIS CSCL 04/2

A physical model of clear-air turbulence is proposed which is created on the basis of the results of summer investigations of the space characteristics of turbulent zones, hydrodynamic and thermodynamic parameters of these zones, the energy spectra of pulsations of vertical and horizontal components of wind velocity, and the spectral rate of turbulent exchange. The quantitative

values of the physical characteristics of the model are given and the mechanism for the formation of clearair turbulence is examined. Author (GRA)

N72-33624# Northern Research and Engineering Corp., London (England).
THE POTENTIAL IMPACT OF AIRCRAFT EMISSIONS UPON AIR QUALITY
M. Platt, R. C. Baker, E. K. Bastress, K. M. Chng, and R. D. Siegel 29 Dec. 1971 330 p refs
(Contract DI-68-02-0085)
(PB-208950; NREC-1167-1) Avail: NTIS HC $9.00 CSCL 13B

The specific objectives were: to select representative airports for which detailed studies would be made of emissions and impact to determine aircraft emission factors and activity levels for the selected airports, to develop future projections of emission rates and their impact at the selected airports, and to determine emission rates and impact of unburned fuel resulting from fuel venting and other practices directly associated with aircraft operating cycles. The survey gives data on hydrocarbons, carbon monoxide, nitrogen oxides, particulates, SO2, and lead; all were in significant concentrations. Large reductions in concentrations of carbon monoxide, total hydrocarbons, nitrogen oxides, and particulates due to emissions of turbine-engine aircraft may be achieved by various control methods. However if this is not done, predictions presented show major pollution increases. Author (GRA)

N72-33625# Batelle Columbus Labs., Ohio.
A STUDY OF THE FATE OF SO2 IN FLUE GAS Final Report
R. W. Coutant, E. L. Merryman, R. E. Barrett, R. D. Giammar, and A. Levy 31 Mar. 1972 43 p refs
(Contract CPA-70-121)
(PB-209259; APTD-1107) Avail: NTIS HC $3.00 CSCL 13B

An attempt was made to simulate, on a laboratory scale, the time-temperature profile of a central-station power plant and the early SO2 plume. The objectives were: identification of sections of the system wherein major depletion in SO2 could be observed; determination of the effect of fuel type on SO2 depletion; determination of the significance of the distribution of fly ash to the overall SO2 depletion; investigation of the rate of oxidation of SO2 in the early stages of plume development; and assessment of the effects of relative humidity, temperature, and process variables on the rate of SO2 loss in the early plume. First-order rate constants for decay of SO2 in the plume agreed with those found by other investigators. Author (GRA)

N72-33626# Colorado State Univ., Fort Collins. Fluid Dynamics and Diffusion Lab.
PENETRATIVE CONVECTIVE INSTABILITIES IN PARALLEL FLOWS
Rene A. Kahawita and Robert N. Meroney May 1972 36 p refs
(Contract N00014-68-A-0493-0001; NR Proj. 062-414; Proj. Themis)
(AD-745380; CER71-72RK-RNM-24; THEMIS-CER-TR-13) Avail: NTIS CSCL 04/1

An analysis has been performed of penetrative convective instabilities arising from the combined action of thermal and centrifugal buoyancy forces. The theory allows for the fact that in the atmosphere, convection arising in an unstable layer may penetrate into a neighboring stable region. The objective has been to examine the effect of various mean temperature and velocity profiles on the critical limit and convective penetration of the disturbances. The linearized perturbation equations have been solved employing an approximate technique. The results obtained indicate that nonlinear profiles are more unstable and penetrative than linear ones. The close analogy between streamline curvature and thermal stratification effects has been demonstrated. Author (GRA)

N72-33627# General Electric Co., Syracuse, N.Y. Electronics Lab.
FIELD STUDY ON APPLICATION OF LASER COINCIDENCE ABSORPTION MEASUREMENT TECHNIQUES Final Report
Feb. 1972 75 p refs
(Contract EPA-EHSD-71-8)
(PB-210671; APTD-0981) Avail: NTIS HC $4.50 CSCL 13B

A field study was conducted on the merits and limitations of laser coincidence absorption measurement technique applied to long path monitoring of a gaseous pollutant in an urban atmosphere. Two gaseous pollutants, ethylene and ammonia, were selected and spectral interferences identified. Using a spectrally tunable CO2 laser, measurement and system evaluation were conducted. Selected pollutant concentrations and spectral interference effects were recorded. Concurrent point measurements were made by gas chromatograph for ethylene concentrations. Overall system effectiveness and test results were analyzed and performance evaluated. GRA

N72-33628# Northeastern Univ., Boston, Mass. Dept. of Mathematics.
CERTAIN FINITE DIFFERENCE METHODS FOR THE SOLUTION OF LARGE SCALE CIRCULATION PROBLEMS Final Scientific Report, 1 Dec. 1968 - 30 Nov. 1971
Robert D. Klein, Jack C. Mettauer, Vito P. Maglione, and Stanley L. Spiegel 1 Jan. 1972 62 p refs
(Contract F19628-69-C-0001; AF Proj. 8604; AF Proj. 8628)
(AD-743934; AFCRL-72-0155) Avail: NTIS CSCL 04/2

Program environments suitable for the investigation of a large number of different grid systems and algorithms relevant for the solution of large scale meteorological circulation problems are presented. One of them employs a mixed grid system to solve the barotropic problem. Inconsistencies arising from linear interpolation between the grids followed by numerical differentiation are examined. Also, a spherical grid system with flexibility of definition on the globe is described and the relationship necessary for its use in a finite differencing scheme is developed. Additionally, a program is presented which is useful for calculating the parameters needed for the numerical evaluation of arbitrary differential operators using information from arbitrarily selected grid points. Author (GRA)

N72-33629# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
SIMULATION RESEARCH TO DEVELOP OBJECTIVE METEOROLOGICAL PREDICTION CAPABILITY Semiannual Report, 16 May - 16 Nov. 1971
Tom E. Sanford May 1972 153 p
(Contract DAAB07-68-C-0280; DA Proj. 1T0-6211-A-126; TAMRF Proj.582)
(AD-744793; A/M-Ref-71-25A; ECOM-0280-7; SAR-7) Avail: NTIS CSCL 04/2

The report is a continuation of the work included in Technical Report ECOM-0280-6 regarding the investigation of the suitability of an alternate expression for the exchange coefficients for momentum which are an integral part of the set of meteorological equations presently being used to simulate the atmospheric boundary layer. Solutions for Cases I-B, II, III, and IV-A of the Dallas Tower Network data incorporating the alternate exchange coefficient are included in the report. These solutions indicate that the alternate expression for the exchange coefficient for momentum produces more realistic results which are consistent with the expected diurnal variation of the exchange coefficients and which yield predicted winds at 8 m height which are closer to the observed values for long time intervals than those winds predicted by the original exchange coefficient relationship. Author (GRA)

N72-33630# American Inst. of Crop Ecology, Silver Spring, Md.
AICE SURVEY OF USSR AIR POLLUTION LITERATURE. VOLUME 14: TECHNICAL PAPERS FROM THE LENINGRAD INTERNATIONAL SYMPOSIUM ON METEOROLOGICAL ASPECTS OF ATMOSPHERIC POLLUTION,

PART 3
M. Y. Nuttonson May 1972 134 p refs
(Grant EPA-R-800878)
(PB-209945; AICE-AIR-72-14; APTD-1145) Avail: NTIS HC $3.00 CSCL 13B

Data on the removal of impurities from the atmosphere by precipitation and clouds are presented. Also presented are data on automatic methods for atmospheric pollution detection, mechanism of photochemical pollution in urban atmospheres, heavy metal concentrations in air of certain regions in U.S.S.R., and numerical characteristics of meteorological conditions associated with heavy atmospheric pollution in western Siberia.
GRA

N72-33631# Naval Postgraduate School, Monterey, Calif.
A METHOD FOR INCORPORATING NESTED FINITE GRIDS IN THE SOLUTION OF SYSTEMS OF GEOPHYSICAL EQUATIONS Ph.D. Thesis
Edward James Harrison, Jr. Jun. 1972 122 p refs
(AD-745190) Avail: NTIS CSCL 04/2

A numerical technique with simultaneous time integration of a meshed grid system is proposed, in which the fine mesh region is able to move within the coarse grid. The interface boundary conditions employed are shown analytically to be the only stable specification of those tested for a simple linear case. Numerical solutions using the meshed system are compared with those from uniform coarse and fine grids. One important criterion is that the solution within the fine mesh region of the meshed grid must have nearly the same accuracy as in a system which uses a fine mesh everywhere. The technique is applied to a two-dimensional (y,p) ten-level primitive equation model. Behavior of the meshed model is examined in experiments in which a small scale heat source is imbedded within an undisturbed zonal flow pattern.
Author (GRA)

N72-33786* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC WIND FIELDS DERIVED FROM NIMBUS OZONE MEASUREMENTS
Cuddapah Prabhakara *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 30-33 (For availability see N72-33780 24-30)
CSCL 04A

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N72-33632*# Naval Electronics Lab. Center for Command Control and Communications, San Diego, Calif.
OMEGA SYNCHRONIZATION AND CONTROL PRACTICAL PROCEDURES FOR THE DETERMINATION OF EPOCH AND ESTIMATION OF FREQUENCY Research and Development Report
E. R. Swanson and C. P. Kugel 19 Mar. 1971 56 p refs
(NASA Order S-51743A-G)
(NASA-CR-126390; AD-732448; NELC-TR-1757) Avail: NTIS HC $5.00 CSCL 17G

Procedures for maintaining the timing sychronization within the Omega navigation system and maintaining the system epoch in agreement with the international time base are discussed. The development of techniques for disseminating time and frequency within the system and/or to an arbitrarily located remote monitor is explained. Synchronization control theory is discussed with reference to both simplified and general optimization.
Author

N72-33633*# National Aeronautics and Space Administration, Washington, D.C.
NATIONAL PLAN FOR DEVELOPMENT OF THE MICROWAVE LANDING SYSTEM
Jul. 1971 113 p refs Prepared in cooperation with FAA
(NASA-TM-X-68637; AD-733268) Avail: NTIS HC $7.75 CSCL 17G

A plan for the development of a new civil/military microwave landing system (MLS) is presented. It delineates the five year program of integrated activity deemed necessary to provide a MLS that meets the wide range of user operational requirements set down by RTCA SC-117. Included in the plan are two interdependent and complementary activities: (1) an industry oriented systems development program designed to produce prototype equipment for flight test and evaluation and, finally, production specifications at the earliest possible date; and (2) a concurrent series of supporting government programs, to be undertaken by DOT/DOD/NASA, which will include validation efforts independent of the industry program, investigations of sub-system concepts and techniques, performance of flight tests and system evaluation efforts, and application of the microwave guidance system to the requirements of the individual users.
Author

N72-33634*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
APOLLO GUIDANCE, NAVIGATION AND CONTROL: GUIDANCE SYSTEM OPERATIONS PLANS FOR MANNED LM EARTH ORBITAL AND LUNAR MISSIONS USING PROGRAM COLOSSUS 3. SECTION 7: ERASABLE MEMORY PROGRAMS
M. H. Hamilton Apr. 1972 75 p
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-115565; R-577-Sect-7) Avail: NTIS HC $5.75 CSCL 17G

Erasable-memory programs (EMPs) designed for the guidance computers used in the command (CMC) and lunar modules (LGC) are described. CMC programs are designated COLOSSUS 3, and the associated EMPs are identified by a three-digit number beginning with 5. LGC programs are designated LUMINARY 1E, and the associated EMPs are identified, with one exception, by a three-digit number beginning with 1. The exception is EMP 99. The EMPs vary in complexity from a simple flagbit setting to a long and intricate logical structure. They all, however, cause the computer to behave in a way not intended in the original design of the programs; they accomplish this off-nominal behavior by some alteration of erasable memory to interface with existing fixed-memory programs to effect a desired result.
Author

N72-33635*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
APOLLO GUIDANCE, NAVIGATION AND CONTROL: GUIDANCE SYSTEM OPERATIONS PLAN FOR MANNED CM EARTH ORBITAL AND LUNAR MISSIONS USING PROGRAM COLOSSUS 3. SECTION 3: DIGITAL AUTOPILOTS (REVISION 14)
Apr. 1972 245 p Revised
(Contract NAS9-4065)
(NASA-CR-115566; R-577-Sect-3-Rev-14) Avail: NTIS HC $14.25 CSCL 17G

Digital autopilots for the manned command module earth orbital and lunar missions using program COLOSSUS 3 are discussed. Subjects presented are: (1) reaction control system digital autopilot, (2) thrust vector control autopilot, (3) entry autopilot and mission control programs, (4) takeover of Saturn steering, and (5) coasting flight attitude maneuver routine.
Author

N72-33636*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
APOLLO GUIDANCE, NAVIGATION AND CONTROL: GUIDANCE SYSTEM OPERATIONS PLAN FOR MANNED

LM EARTH ORBITAL AND LUNAR MISSIONS USING PROGRAM LUMINARY 1E. SECTION 7: ERASABLE MEMORY PROGRAMS
M. H. Hamilton Apr. 1972 50 p
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-115564; R-567-Sect-7) Avail: NTIS HC $4.50 CSCL 17G
For abstract, see N72-33634

N72-33637*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
GUIDANCE SYSTEM OPERATIONS PLAN FOR MANNED CM EARTH ORBITAL AND LUNAR MISSIONS USING PROGRAM COLOSSUS 3. SECTION 2: DATA LINKS Apollo Guidance, Navigation and Control
Margaret H. Hamilton Nov. 1971 168 p Revised
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-115747; R-577-Sect-2-Rev-15) Avail: NTIS HC $10.50 CSCL 17G
The data links for use with the guidance system operations plan for manned command module earth orbital and lunar missions using program Colossus 3 are presented. The subjects discussed are: (1) digital uplink to CMC, (2) command module contiguous block update, (3) CMC retrofire external data update, (4) CMC digital downlink, and (5) CMC entry update. Author

N72-33638*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
GUIDANCE SYSTEM OPERATIONS PLAN FOR MANNED LM EARTH ORBITAL AND LUNAR MISSIONS USING PROGRAM LUMINARY 1E. SECTION 2: DATA LINKS Apollo Guidance, Navigation and Control
Margaret H. Hamilton Apr. 1972 157 p Revised
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-115748; R-567-Sect-2-Rev-12) Avail: NTIS HC $10.00 CSCL 17G
Data links for the guidance system of manned lunar module orbital and lunar missions are presented. Subjects discussed are: (1) digital uplink to lunar module, (2) lunar module liftoff time increment, (3) lunar module contiguous block update, (4) lunar module scatter update, (5) lunar module digital downlink, and (6) absolute addresses for update program. Author

N72-33639*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
INVESTIGATION OF THE EPOCH STATE FILTER M.S. Thesis
Joan Annette Edwards Feb. 1972 212 p refs
(Contract NAS9-10386; DSR Proj. 55-41200)
(NASA-CR-128539; T-569) Avail: NTIS HC $12.75 CSCL 17G
A navigation filtering technique has been formulated using as state variables the initial or epoch position and velocity of the spacecraft. The estimate of this initial state is then improved by filtering new measurements. The current state may be obtained by a conic extrapolation of the epoch state. Results of a digital computer simulation of the epoch state filter show that this formulation of the navigational problem results in less computer run time and less computer storage space than conventional techniques. The errors produced by this technique have been demonstrated to be comparable to those obtained by conventional maximum-likelihood filtering. Author

N72-33640# Joint Publications Research Service, Arlington, Va.
USE OF EXTERNAL INFORMATION ON THE LINEAR VELOCITY OF A VEHICLE FOR CORRECTING INERTIAL NAVIGATION SYSTEMS
V. A. Karakashev 17 Oct. 1972 6 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), no. 7, 1972 p 81-84
(JPRS-57282) Avail: NTIS HC $3.00
An analysis is made of the principle of using external information concerning the linear velocity of an object to adjust inertial navigation systems. It is demonstrated that the use of the external linear velocity allows information to be determined concerning the angular velocities of oscillations of the vertical analogue and angular deviations of the analogue of the axis of diurnal rotation of the earth, and, consequently, adjustment of the inertial navigation system. Author

N72-33641# National Aviation Facilities Experimental Center, Atlantic City, N.J.
TEST AND EVALUATION OF CATEGORY 3 ILS GROUND GUIDANCE EQUIPMENT STAN-38 GLIDE SLOPE TESTS AT NAFEC ON RUNWAY 4 Final Report, Aug. 1969 - May 1971
Edmund A. Zyzys Sep. 1972 70 p
(FAA Proj. 073-318-01X)
(FAA-NA-72-13; FAA-RD-72-105) Avail: NTIS HC $5.50
A STAN-38 glide slope system in an M-array without clearance configuration was installed on runway 4 at the National Aviation Facilities Experimental Center (NAFEC), Atlantic City, New Jersey. The system was tested for conformance to ICAO Annex 10 Category 3 ILS specifications for system performance and stability, and for monitor performance with amplitude and phase errors in the antenna system. The effects of prevailing weather conditions on the executive monitor system were recorded. It was concluded that the primary performance characteristics met ICAO specifications, and that the executive monitor system using specified alarm limits for the test provided satisfactory alarms during degraded performance conditions except in the dephased upper antenna fault condition. Author

N72-33642*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT OF STOLAND, A VERSATILE NAVIGATION, GUIDANCE AND CONTROL SYSTEM
L. S. Young, Q. M. Hansen, W. E. Rouse (Sperry Flight Systems Div.), and S. S. Osder (Sperry Flight Systems Div.) Oct. 1972 13 p
(NASA-TM-X-62183) Avail: NTIS HC $3.00 CSCL 17G
STOLAND has been developed to perform navigation, guidance, control, and flight management experiments in advanced V/STOL aircraft. The experiments have broad requirements and have dictated that STOLAND be capable of providing performance that would be realistic and equivalent to a wide range of current and future avionics systems. An integrated digital concept using modern avionics components was selected as the simplest approach to maximizing versatility and growth potential. Unique flexibility has been obtained by use of a single, general-purpose digital computer for all navigation, guidance, control, and displays computation. Author

N72-33643*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
THE READOUT-AXIS STABILITY OF ELASTIC NEARLY SPHERICAL GYRO ROTORS
William N. Blanchard and Benjamin Lange Sep. 1971 121 p refs Sponsored in part by NASA
(Contracts F33615-70-C-1637; F33615-67-C-1245)
(NASA-CR-128353; AD-743972; SUDAAR-431) Avail: NTIS HC $8.25 CSCL 17G
The accuracy and stability of readout-axis orientation in arbitrary free-rotor-gyroscopes is discussed. Particular emphasis is focused on predicting the location and stability of the readout axis of an unsupported gyroscope which is the proof mass in a drag-free satellite and which, being in free fall, does not require support forces. A model of the elastic nearly spherical rotor is developed, which assumes that the nonspinning rotor is a perfect sphere, with additional point masses or holes of negative mass on its surface. These added masses represent the inertia nonsphericity and possible anisotropy of the rotor. A systematic technique based on measured rotor inertia properties is presented for determining the magnitude and location of the masses that are necessary to model an arbitrary nearly spherical rotor.
Author

N72-33644*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STUDY OF AIRCRAFT CENTERED NAVIGATION, GUIDANCE, AND TRAFFIC SITUATION SYSTEM CONCEPT FOR TERMINAL AREA OPERATION
Willard W. Anderson, Ralph W. Will, and Carolyn Grantham Washington Nov. 1972 53 p refs
(NASA-TN-D-6992; L-8168) Avail: NTIS HC $3.00 CSCL 17G

A concept for automating the control of air traffic in the terminal area in which the primary man-machine interface is the cockpit is described. The ground and airborne inputs required for implementing this concept are discussed. Digital data link requirements of 10,000 bits per second are explained. A particular implementation of this concept including a sequencing and separation algorithm which generates flight paths and implements a natural order landing sequence is presented. Onboard computer/display avionics utilizing a traffic situation display is described. A preliminary simulation of this concept has been developed which includes a simple, efficient sequencing algorithm and a complete aircraft dynamics model. This simulated jet transport was flown through automated terminal-area traffic situations by pilots using relatively sophisticated displays, and pilot performance and observations are discussed. Author

N72-33645# Lincoln Lab., Mass. Inst. of Tech., Lexington.
AIR TRAFFIC CONTROL Quarterly Technical Summary, 1 Feb. - 30 Apr. 1972
Herbert G. Weiss 15 May 1972 17 p refs
(Contract F19628-70-C-0230; AF Proj. 649L)
(AD-744826; ESD-TR-72-86) Avail: NTIS CSCL 17/7

The report summarizes the progress on the Air Traffic Control tasks. The principal effort was directed toward reaching a status which will permit the presentation of tentative conclusions and reports because several of the tasks must be terminated in FY 72. The radar MTI study effort will continue under FAA sponsorship, and the analysis of microwave landing guidance systems will be maintained for the Air Force. Discussions are under way concerning the scope and level of future Air Force-supported effort on airborne graphical displays and CNI system performance analysis. Author (GRA)

N72-33646# Control Data Corp., Minneapolis, Minn. Navigation and Space Systems.
CRITICAL BREADBOARD FABRICATION AUTOMATED ASTRONOMIC POSITIONING SYSTEM Final Scientific Report, 1 Sep. 1971 - 24 Feb. 1972
Joseph E. Carroll, Darrol S. Herold, and Paul H. Nurkhala 30 Mar. 1972 41 p refs
(Contract F19628-72-C-0015; AF Proj. 7600)
(AD-743947; AFCRL-72-0246) Avail: NTIS CSCL 17/7

The Final Report summarizes the results of three critical breadboard areas for the Automated Astronomic Positioning System and is a follow-on of Contract No. F19628-71-C-0036. The three areas investigated were (a) fabrication of a solid CER-VIT optical structure, (b) clamping experiments on test samples of CER-VIT, and (c) fabrication and testing of an electronic filter breadboard. Author (GRA)

N72-33647# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
LOCK-ON RANGES OF LASER-GUIDED SYSTEMS M.S. Thesis
James V. Mardis Jun. 1972 98 p refs
(AD-744814; GEP/PH/72-12) Avail: NTIS CSCL 17/7

The thesis is an evaluation of the factors that determine the maximum acquisition and tracking (lock-on) range of laser-guided systems in the military close-air-support mission. The problem is divided into a study of the designed system parameters which are characterized by a clear-air lock-on range, and a study of the effect of the intervening atmosphere. Three model atmospheres are considered: a homogeneous, an exponential, and a three-layer stratified atmospheric aerosol vertical structure. The vertical aerosol number density distribution of a real atmosphere can be bracketed between a homogeneous and an exponential atmospheric model. Conversion charts from clear-air lock-on range to actual lock-on range for the three model atmospheres are plotted. Author (GRA)

N72-33648# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF IONOSPHERIC TILT ON RADIO DIRECTION FINDING POSITION ESTIMATES M.S. Thesis
Roger Kenneth Lunde Mar. 1972 59 p refs
(AD-743738) Avail: NTIS CSCL 17/3

It is generally accepted that the ionosphere tilts; that is to say, an isoionic layer is not at constant height above the surface of the earth. Ionospheric tilt has the effect of deflecting a radio ray out of its great-circle plane and returning it to earth at an angle not that of the true bearing from a receiver to a transmitter. The magnitude of error introduced by this effect on radio direction finding (RDF) position estimates was studied. A model assigning a tilt bias of less than three degrees to each RDF station bearing was constructed. Analysis of a six-station RDF network revealed that this amount of tilt has negligible effect on point estimates of location and their confidence regions. Author (GRA)

N72-33649# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
SPACE PROGRAMS Quarterly Progress Report, 1 Oct. - 31 Dec. 1971
Dec. 1971 21 p refs
(Contract N00017-72-C-4401)
(AD-744659; APL-U-SQR/71-4) Avail: NTIS CSCL 17/7

Activities are reported in the following categories: SAS-C preliminary thermal design; environmental tests of a small astronomy satellite; Triad dual-channel demodulators; Geoceiver buffer; NAVOCEANO Geoceiver navigation program; AN/SRN-9 program support; Project Magnet GASS system integration with RP-3D aircraft; and technical support of a U.S. Geological Survey. Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see 24 Physics, Atomic, Molecular, and Nuclear. For related information see also 03 Auxiliary Systems; and 28 Propulsion Systems.

N72-33650 National Lending Library for Science and Technology, Boston Spa (England).
STATE OF HELIUM TECHNOLOGY IN HIGH-TEMPERATURE REACTORS
C. B. VonDerDecken, H.-W. Mueller, and W. H. Muser 7 Jun. 1972 14 p Transl. into ENGLISH from Atomwirtsch., Atomtech. (Duesseldorf), Aug. - Sep. 1971 p 463-472
(NLL-Risley-TR-2314-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Helium technology and design features typical of helium-cooled high-temperature reactors are discussed. The concepts discussed include: radioactive impurities, chemical impurities, frictional values in pure helium, flow and heat transfer, and thermal insulation. F.O.S.

N72-33651*# Aerojet Nuclear Co., Idaho Falls, Idaho.
GAMMA HEATING IN REFLECTOR HEAT SHIELD OF GAS CORE REACTOR
J. H. Lofthouse, J. F. Kunze, T. E. Young, and R. C. Young Aug. 1972 37 p refs
(NASA Order C-54558-B)
(NASA-CR-120903; ANCR-1077) Avail: NTIS HC $4.00 CSCL 21F

Heating rate measurements made in a mock-up of a BeO heat shield for a gas core nuclear rocket engine yields results nominally a factor of two greater than calculated by two different methods. The disparity is thought to be caused by errors in neutron capture cross sections and gamma spectra from the low cross-section elements, D, O, and Be. Author

N72-33652*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CALCULATION OF RADIATION INDUCED SWELLING OF URANIUM MONONITRIDE USING THE DIGITAL COMPUTER PROGRAM CYGRO 2
Harry W. Davison and Ivan B. Fiero Washington Mar. 1971 15 p refs
(NASA-TM-X-2224; E-5951) Avail: NTIS HC $3.00 CSCL 18J

Fuel volume swelling and clad diametral creep strains were calculated for five fuel pins, clad with either T-111 (Ta-8W-2.4Hf) or PWC-11 (Nb-1Zr-0.1C). The fuel pins were irradiated to burnups between 2.7 and 4.6%. Clad temperatures were between 1750 and 2400 F (1228 and 1589 K). The maximum percentage difference between calculated and experimentally measured values of volumetric fuel swelling is 60%. Author

N72-33653*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IN-PILE AND OUT-OF-PILE TESTING OF A MOLYBDENUM-URANIUM DIOXIDE CERMET FUELED THEMIONIC DIODE
Dominic C. Dilanni Washington Jan. 1972 57 p refs
(NASA-TM-X-2451; E-5962) Avail: NTIS HC $3.00 CSCL 18J

The behavior of Mo-UO2 cermet fuel in a diode for thermionic reactor application was studied. The diode had a Mo-0.5 Ti emitter and niobium collector. Output power ranged from 1.4 to 2.8 W/cm squared at emitter and collector temperatures of 1500 deg and 540 C. Thermionic performance was stable within the limits of the instrumentation sensitivity. Through 1000 hours of in-pile operation the emitter was dimensionally stable. However, some fission gases (15 percent) leaked through an inner clad imperfection that occurred during fuel fabrication. Author

N72-33654# Oak Ridge National Lab., Tenn. Reactor Div.
REQUIREMENTS TO BE MET FOR AN ECONOMICALLY ATTRACTIVE EXPLODING PELLET FUSION REACTOR
A. P. Fraas Apr. 1972 16 p refs Presented at Region 3 Conf. on Scanning the Spectrum, Knoxville, Tenn. 10-12 Apr. 1972 Sponsored by AEC
(Conf-720401-3) Avail: NTIS

Energy balance, blast containment, and fuel costs are considered. In particular, boundary conditions that must be met if this type of system is to be economically feasible are discussed. NSA

N72-33655# Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE INTERNATIONAL WORKING SESSIONS ON FUSION REACTOR TECHNOLOGY
Don Steiner 2 Jul. 1971 402 p refs Conf. held at Oak Ridge, Tenn., 28 Jun. - 2 Jul. 1971
(Contract W-7405-eng-26)
(Conf-710624) Avail: NTIS

A state-of-the-art presentation and session summary are given for the following areas: (1) engineering design of blankets, (2) plasma heating and ignition, (3) neutronics, (4) surface phenomena, (5) radiation damage, (6) plasma fueling and recovery, (7) engineering design of magnet systems, and (8) energy conversion systems. NSA

N72-33656# Virginia Inst. of Marine Science, Gloucester Point.
DESIGN OF THE MONITORING SYSTEM FOR THE THERMAL EFFECT STUDY OF THE SURRY NUCLEAR POWER PLANT ON THE JAMES RIVER Special Report in Applied Marine Science and Ocean Engineering No. 16
R. L. Bolus, S. N. Chia, and C. S. Fang Oct. 1971 75 p refs
(Contract AT(40-1)-4067)
(TID-26006) Avail: NTIS

The program for monitoring thermal discharges from the Surry power reactor units 1 and 2 to the James River is reviewed. Instrumentation used for the monitoring program is described. Recorded data are included. NSA

N72-33657# Los Alamos Scientific Lab., N.Mex.
PRELIMINARY MISSION STUDIES FOR A SMALL NUCLEAR ENGINE
J. D. Balcomb Mar. 1972 14 p
(Contract W-7405-eng-36)
(LA-4890) Avail: NTIS

Single-burn, multiple-burn, and multiple-stage planetary probes, as well as lunar and geosynchronous shuttle vehicles, were considered. Results indicate that a 300 MW engine with a thrust of approximately 15,000 lbf, an engine mass of 6000 lbm, and a specific impulse of 825 to 875 sec would be very attractive for a wide variety of advanced missions and payloads, including many missions that have previously been considered for the much larger NERVA engine. The small engine is particularly suitable for unmanned missions to the outer planets. Author (NSA)

N72-33658# Atomic Energy Commission, Washington, D.C.
FUSION REACTOR FIRST WALL MATERIALS, SUMMARY
L. C. Anniello, ed. Apr. 1972 124 p refs Meeting held at Germantown, Md., 27-28 Jan. 1972
(WASH-1206; Conf-720112) Avail: NTIS

The results are presented of a meeting held to examine the scope of problems and priorities in first-wall materials for fusion reactors. A number of problem areas were reviewed together with their relationship to both quasi-steady state and pulsed reactor confinement schemes of the toroidal and mirror types. Uncertainties in design and a paucity of specific data made an exact assessment of priorities difficult. Nevertheless, a meaningful discussion was possible based on information available from other programs. Among the more important areas discussed were wall erosion, wall compatibility with the coolant, wall integrity from the standpoint of radiation-induced swelling and embrittlement due to gas and defect accumulation, and hydrogen and tritium effects. Author (NSA)

N72-33659# Hanford Engineering Development Lab., Richland, Wash.
NUCLEAR REACTOR INSTRUMENTATION EMPLOYING MICROWAVE TECHNIQUES
T. Roger Billeter Mar. 1972 47 p refs
(Contract AT(45-1)-2170)
(HEDL-TME-72-25) Avail: NTIS

Methods are described for using microwave techniques as reliable instrumentation for the monitoring and control of various physical properties of operating nuclear reactors. General characteristics of microwaves are discussed and the theory of operation of sensors using microwave techniques is described. Specific prototype systems are described for monitoring temperatures, pressure, and impurity measurements as well as a prototype system for monitoring several physical properties simultaneously. Author (NSA)

N72-33660# Naval Research Lab., Washington, D.C.
IRRADIATION EFFECTS ON REACTOR STRUCTURAL MATERIALS Quarterly Progress Report, 1 Feb. - 30 Apr. 1972
L. E. Steel, F. A. Smidt, Jr., J. A. Sprague, P. Shahinian, H. E. Watson, H. H. Smith, J. R. Hawthorne, C. Z. Serpan, Jr., and A. G. Pieper May 1972 47 p refs
(AD-744941; NRL-MR-2441) Avail: NTIS CSCL 18/10

The research program involves a broad study of the effects of nuclear radiation upon materials. The report, covering research for the period 1 February - 30 April 1972, includes: (1) electron

microscopy observations of radiation damage in pressure vessel steels and iron alloys, (2) the effect of neutron irradiation on fatigue crack propagation in austenitic stainless steel at high temperature, (3) a study of radiation reduction in notch toughness of stainless steel submerged arc weldments, (4) the effect of cyclotron-injected helium on the fatigue properties of 316 stainless steel, and (5) preliminary results from an environmental exposure of candidate CTR first-wall structural alloys.
Author (GRA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics; 20 Meteorology; and 29 Space Radiation.

N72-33661# Environmental Protection Agency, Washington, D.C.
NOISE: THE ULTIMATE INSULT
Alfred Etter 29 Jul. 1971 4 p Presented at Chicago Noise Hearings, 28-29 Jul. 1971
Avail: NTIS HC $3.00

The inhumanity of man's noise in the cities is protested. The effects of noise on animals forced to listen to noise are briefly discussed. The traditional use of noise to ridicule, embarrass, denigrate, and curse is contrasted with silence being used for worship, respect, anticipation, and love. It is concluded that the cities have destroyed nature, and created a tumult of noise borne of their demands for every convenience, every novelty, and every protection from exercise.
F.O.S.

N72-33662*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE OPTICAL PROPERTIES OF PLATINUM AND GOLD IN THE VACUUM ULTRAVIOLET
Roger C. Linton Washington Oct. 1972 39 p refs
(NASA-TN-D-7061; M-449) Avail: NTIS HC $3.00 CSCL 20F

The optical constants of platinum and gold thin films have been determined in the spectral region of 40 to 200 nm by reflection measurements. The highly polarized continuum of synchrotron radiation emitted by the 240-MeV electron storage ring at the Physical Sciences Laboratory of the University of Wisconsin was used as a light source for the spectrum below 120 nm, while a windowless discharge lamp coupled to a normal incidence monochromator provided a source for the longer wavelengths. Optical constants were determined by a computer program based on iterative solutions to the Fresnel equations for reflection as a function of the angle of incidence.
Author

N72-33663*# Arizona Univ., Tucson. Optical Sciences Center.
ELECTROMAGNETIC DIFFRACTION BY PLANE REFLECTION DIFFRACTION GRATINGS Final Report
R. P. Bocker and A. S. Marathay Jul. 1972 10 p refs
(Contract NAS5-11456)
(NASA-CR-130092) Avail: NTIS HC $3.00 CSCL 20C

A plane wave theory was developed to study electromagnetic diffraction by plane reflection diffraction gratings of infinite extent. A computer program was written to calculate the energy distribution in the various orders of diffraction for the cases when the electric or magnetic field vectors are parallel to the grating grooves. Within the region of validity of this theory, results were in excellent agreement with those in the literature. Energy conservation checks were also made to determine the region of validity of the plane wave theory. The computer program was flexible enough to analyze any grating profile that could be described by a single value function f(x). Within the region of validity the program could be used with confidence. The computer program was used to investigate the polarization and blaze properties of the diffraction grating.
Author

N72-33664# Brookhaven National Lab., Upton, N.Y. Physics Dept.
MAGNETISM IN ONE AND TWO DIMENSIONS
M. Blume [1971] 19 p refs Presented at 5th IAEA Symp. on Neutron Inelastic Scattering, Grenoble, France, 6 Mar. 1972 Sponsored by AFC
(BNL-16706; Conf-720304-7) Avail: NTIS

An outline is given of recent work on experimental and theoretical studies of one- and two-dimensional magnetic systems, particularly dynamic properties. The qualitative properties of these systems is illustrated by the examples of tetramethyl ammonium manganese chloride and K2NiF4.
Author

N72-33665# Institut fuer Plasmaphysik G.m.b.H., Garching (West Germany).
INVARIANT CURVES OF PLANE MAPPINGS
Karl Graf Finck VonFinckenstein, Karl-Ulrich VonHagenow, and Arnulf Schlueter Nov. 1971 26 p refs In GERMAN; ENGLISH summary
(IPP-6/100) Avail: AEC Depository Libraries

A special problem relating to the existence of magnetic surfaces near the axis of a toroidal magnetic field is dealt with: given a plane mapping T with a fixed point p; considered are the conditions under which T has invariant curves around p. First, the cases where the curves concerned are ellipses or hyperbolae are discussed. Here, all continuous mappings that keep such curves invariant can be characterized. A few more general investigations are then made and, finally, examples are studied.
Author (NSA)

N72-33666# Scientific Research Inst. of Electro-Physical Apparatus, Leningrad (USSR).
PARAMETRIC INSTABILITIES OF A TOROIDAL HIGH FREQUENCY DISCHARGE IN A MAGNETIC FIELD
I. M. Roife, M. A. Vasilevskii, and E. V. Seredenko 1971 11 p refs In RUSSIAN; ENGLISH summary
(NP-19268) Avail: AEC Depository Libraries

Experimental results of the RF discharge in a toroidal chamber in a magnetic field are reported. The discovered MHD instability has the character of a parametric instability for RF currents in a longitudinal magnetic field. The experimental results are MHD compared to calculations carried out for an ideal MHD model.
Author (NSA)

N72-33667# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RETOUCHING THE LENSES OF LARGE OBJECTIVES WITH THE AID OF AN UNEQUAL ARM LASER INTERFEROMETER
V. N. Esina, V. Ya. Yurchenko, and V. A. Savin 4 Apr. 1972 9 p ref Transl. into ENGLISH from Nov. Tekh. Astron. (Kazan), no. 3, 1970 p 213-216
(AF Proj. 7660)
(AD-743660; FTD-HC-23-2018-71) Avail: NTIS CSCL 20/6

A description of a scheme for manually retouching the lenses of large objectives using an unequal arm interferometer which contains a gas laser as a source of monochromatic light is given. The proposed technique makes it possible to perform rapid quantitative analysis of the wave aberrations of an objective after each short term retouching session. It is shown that with the aid of this technique it is possible to construct an objective operating within a small field of vision from inaccurately fabricated lenses and to correct all the errors of the objective by manually retouching only one of its surfaces.
Author (GRA)

N72-33668# Army Electronics Command, Fort Monmouth, N.J.
INFRARED SPECTRAL RADIANT INTENSITY BALLISTIC AERIAL TARGET SYSTEM (BATS) FLARE

Leonard H. Holden, Jr. Jun. 1972 32 p refs
(DA Proj. 1H6-63718-D-267)
(AD-744473; ECOM-5439) Avail: NTIS CSCL 20/6

During May 1971 the Missile Electronic Warfare Technical Area performed a series of experiments to determine the spectral radiant intensity of flares used with the ballistic aerial target system. This report presents data recorded and analyzed on spectral radiant intensity for selected bands of the flare. Measurements were made at different aspect angles with flares fired in a static position. The technique, calibration, data reduction, and instrumentation used in this experiment are discussed. Author (GRA)

N72-33669# Naval Ordnance Lab., White Oak, Md.
DETECTION OF FLUCTUATING SONAR TARGETS
R. J. Urick and G. C. Gaunaurd 26 Apr. 1972 27 p refs
(AD-744646; NOLTR-72-47) Avail: NTIS CSCL 17/1

Fluctuations are characteristic of sounds in the sea. They affect detection by causing the detection probability of weak signals to be higher, and of strong signals to be lower, than in the absence of fluctuations. The effect can be expressed quantitatively by means of receiver operating characteristic (ROC) curves having a fluctuation index k as a parameter. The fluctuation-modified ROC's are found to be similar to conventional ROC's for non-fluctuating signals ($k=1$), but on probability coordinates have a slope that depends on the value of k. The application of the new ROC's is limited at the present time by a lack of knowledge concerning signal fluctuations and the values of k applicable to a given sonar detection problem.
Author (GRA)

N72-33670# Naval Underwater Systems Center, Newport, R.I. Ocean Science Dept.
SHALLOW WATER INVESTIGATIONS AT THE NAVAL UNDERWATER SYSTEMS CENTER
Bernard Sussman, William R. Schumacher, and William G. Kanabis 1 Jun. 1972 27 p refs
(NUSC Proj. A-650-69; SF1155200814054)
(AD-744926; NUSC-4269) Avail: NTIS CSCL 17/1

The objective of these efforts is to formulate a model suitable for sonar performance prediction in shallow water. For this purpose, the BIFI range, which is 18.6 miles long and 110 ft deep, was established with bottom-mounted acoustic sources and receivers and moored oceanographic telemetering buoys. Measurements of propagation loss, time smear, frequency smear, and, in addition, temperature profiles and salinity provided a data bank for average values and fluctuations of a number of shallow water acoustic and oceanographic parameters. These oceanographic data were supplemented by others obtained from hydrographic and aerial radiometer surveys and from geological studies. Evidence from tests using explosives as sound sources indicated that the lowest of the normal modes was predominant in the received signal. This led to the design and emplantment of a normal mode source consisting of 25 hydrophones capable of transmitting any desired low mode in the frequency range 1 to 4.5 kHz. Author (GRA)

N72-33671# Texas Univ., Austin. Research Center.
A BIBLIOGRAPHY ON THE KERR EFFECT
G. B. Thurston, M. Osman, and R. S. Wilkinson 2 Mar. 1972 57 p refs
(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-744857; TM-31; AFOSR-72-0733TR) Avail: NTIS CSCL 07/4

The bibliography is concerned with the Kerr effect, the experimental methods of generation of the effect, the theories for the phenomenon, from both phenomenological and molecular bases, and the properties of materials which exhibit the effect. The literature surveyed covers the period from 1960 through 1971. Author (GRA)

N72-33672# Naval Underwater Systems Center, Newport, R.I.
ACOUSTIC PROPAGATION IN MOVING OCEAN CHANNELS
Lewis A. Stallworth 8 May 1972 137 p refs
(AD-743723; NUSC-TR-4271) Avail: NTIS CSCL 20/1

The effects of current on the ray geometry, spreading loss, boundary loss and phase shift, and travel time of individual continuous-wave (CW) arrivals, as well as the effects on the total acoustic field, are analyzed for three distinct ocean channels: one with constant sound speed and spatially uniform current, one with linear depth-dependent sound speed and spatially uniform current, and one with constant sound speed and linear depth-dependent current. When possible, the theory is compared with actual acoustic-field observations. Author (GRA)

N72-33673# Catholic Univ. of America, Washington, D.C. Inst. of Ocean Science and Engineering.
IMAGING THROUGH A CONFOCAL OPTICAL INTERFERENCE FILTER Semiannual Technical Report Summary, 1 Dec. 1971 - 31 May 1972
Joseph A. Clark Jun. 1972 20 p refs
(Contract N00014-67-A-0377-0014; ARPA Order 1950)
(AD-744686; Rept-72-8) Avail: NTIS CSCL 20/6

The problem of spatial and temporal filtering of an image by a spherical mirror type of optical interference filter is formulated. Improvements over current optical filter designs by 1,000 in the temporal resolution of optical images appear feasible. Applications, including velocity, temperature and turbulence distribution measurements and acousto-optic image conversion, are discussed. Author (GRA)

N72-33674# Naval Research Lab., Washington, D.C.
SHIP (SIMPLIFIED-HELMHOLTZ-INTEGRAL PROGRAM): A FAST COMPUTER PROGRAM FOR CALCULATING THE ACOUSTIC RADIATION AND RADIATION IMPEDANCE FOR FREE-FLOODED-RING AND FINITE-CIRCULAR-CYLINDER SOURCES Interim Report
P. H. Rogers 19 Jun. 1972 64 p refs
(NRL Proj. S02-19)
(AD-745295; NRL-7240) Avail: NTIS CSCL 20/1

The Naval Research Laboratory SHIP is a special-purpose acoustic radiation program designed for rapidly determining acoustic surface pressures, radiation impedances, and far-field radiation patterns for acoustic sources in the form of finite cylinders and free-flooded rings and for acoustic sources which can be approximated by such forms. The program uses a finite-element method based on a one-dimensional version of the surface Helmholtz integral equation. Axial symmetry is assumed in all cases. It is the complete use of this axial symmetry which results in the high speed of this method relative to other formulations of this problem. The basic inputs to the program are the geometry of the ring or cylinder and the normal velocity on the surface of this source. The output is a representation of the complex acoustic pressure distribution on the surface of the source, the radiation impedance, and (if desired) the far-field radiation pattern. The program is presently limited to a single ring or single cylinder, but it may easily be modified to handle coaxial stacks of rings and cylinders. Author (GRA)

N72-33675# Environmental Protection Agency, Washington, D.C.
STATE AND MUNICIPAL NONOCCUPATIONAL NOISE PROGRAMS Final Report
31 Dec. 1971 39 p refs
(PB-208659; EPA-NTID300.8) Avail: NTIS HC $3.00 CSCL 13B

A report is presented on state and municipal government nonoccupational noise abatement and control programs prepared from information obtained in response to a questionnaire disseminated by the Environmental Protection Agency (EPA). They were forward by the EPA Administrator to the governors of each state (including Guam, Puerto Rico, the Virgin Islands) and the mayors of the 153 cities having populations, as of 1970, of

100,000 or more. The questionnaire requested information concerning the level and scope of existing and planned noise abatement and control programs. It furthermore solicited opinions on what additional support programs could be developed by the Federal government. Author (GRA)

N72-33676# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ELECTRICAL BREAKDOWN AND DISCHARGE IN A VACUUM
I. N. Slivkov, V. I. Mikhailov, N. I. Sidorov, and A. I. Nastyukha 21 Apr. 1972 354 p refs Transl. into ENGLISH of the publ. "Elektricheskii Proboi Razryad Vacuume" Moscow, Atomizdat, 1966 p 1-298
(AF Proj. 1256)
(AD-745471; FTD-MT-24-123-71) Avail: NTIS CSCL 20/3

Vacuum insulation is widely used in various instruments and installations. However, the mechanisms of the processes which occur in the vacuum gap both in the prebreakdown region and during breakdown cannot be considered sufficiently clear, although these questions have been the subject of numerous studies. This book is a systematized presentation of experimental data and a certain generalization of information on vacuum electrical insulation and self-maintained discharge in a vacuum.
Author (GRA)

N72-33677# National Bureau of Standards, Washington, D.C.
FUNDAMENTALS OF NOISE: MEASUREMENT, RATING SCHEMES, AND STANDARDS
31 Dec. 1971 167 p Sponsored by Environ. Protection Agency
(PB-206727; EPA-NTID300.15) Avail: NTIS HC $3.00 CSCL 20A

The report is intended to serve as an introduction to noise, including the inter-relationship between physical measures and psychological responses. The basic principles of sound generation and propagation are discussed as well as the measurement of both the physical attributes of noise and the effects of noise on people. The suitability and effectiveness of various noise exposure rating schemes, used to estimate or predict the effects of noise on man, are discussed and critiqued. Included are sample calculations of sound level, loudness level, and perceived noise level for five selected spectra. The need is stressed for inclusion of well-defined environmental and operational requirements into measurement procedures for those devices where the noise produced is dependent on the surroundings and the operation of the device. Also presented are a glossary of pertinent acoustic terminology and a compilation of existing standards related to noise. Author (GRA)

N72-33678# Mitre Corp., McLean, Va.
A PROTOTYPE STANDARD AND INDEX FOR ENVIRONMENTAL NOISE QUALITY
Steven N. Goldstein Oct. 1971 16 p Presented at 82d Meeting of the Acoust. Soc. of Am., Denver, Colo., 21 Oct. 1971 Submitted for publication
(PB-210221; MTP-358) Avail: NTIS HC $3.00 CSCL 20A

A prototype technical standard for environmental noise is proposed in terms enabling an index of noise quality to be defined and calculated. The standard takes into account the damaging aspects of chronic exposure to loud noise as well as psychologically disturbing aspects of typical community noises which are not loud enough to be physically dangerous. Inasmuch as the standard is intended to portray environmental quality rather than to reflect damage risk criteria, it is generally conservative with respect to work related noise standards, such as those specified by the Walsh-Healey Act. The basic standard specifies a distribution of noise intensities to which an individual might be exposed in a 24-hour period. The distribution may be approximated by the composite of three Gaussian distributions with means and standard deviations of (30 and 3), (50 and 8.5), and (70 and 14)dB (A). Author (GRA)

N72-33679# Stanford Univ., Calif. Electronics Labs.
SPACE-VARIANT IMAGE MOTION DEGRADATION AND RESTORATION
Alexander Andrew Sawchuk May 1972 132 p refs
(Contract N00014-67-A-0112-0023)
(AD-744637; SU-SEL-72-020; TR-6415-3) Avail: NTIS CSCL 20/6

A complete description of motion degradation in linear incoherent, optical systems is presented. Given a mechanical description of motion between object and imaging system, an equivalent two-dimensional linear system is derived which includes all the motion degradation effects. The system is space-variant in the general case in that each point in the object intensity distribution is blurred by an amount which varies with position to form the recorded image. A number of examples are discussed including the space-invariant pointspread functions of planar object-image translation and space-variant cases of rotational motion and coordinate distortions. The effects of systems in cascade are treated and the motion and pointspread functions for general aerial imaging systems are derived in detail. Several a posteriori methods are given for restoring and enhancing images blurred by linear space-variant and invariant operations. Author (GRA)

N72-33680# Naval Postgraduate School, Monterey, Calif. Ocean Physics Group.
FREQUENCY DEPENDENCE OF SOUND TRANSMITTED FROM AN AIRBORNE SOURCE INTO THE OCEAN
Herman Medwin and R. A. Helbig 15 May 1972 53 p refs
(AD-744590; NPS-61MD72051A) Avail: NTIS CSCL 20A

The predicted dependence of sound transmission on the statistics of the randomly-rough interface between dissimilar fluids has been studied by use of the Helmholtz Integral. The predictions have been verified for radiation from a helicopter hovering, and slowly moving, over the sea, for frequencies to 1000 Hz for a wide range of slowly moving, over the sea, for frequencies to 1000 Hz for a wide range of surface acoustical roughnesses. The roughness parameters are the rms height of the surface, propagation constant, speed of propagation and angle with the normal, respectively. The transmission change of sound pressure as a function of frequency is presented for several conditions of an SH3-D helicopter hovering and flying over or near an array of microphone and sonobuoy hydrophones.
Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N72-33681* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRODUCTION OF HIGH PURITY I-123 Patent
James W. Blue, Wayne R. Smith, and Vincent J. Sodd, inventors (to NASA) Issued 26 Sep. 1972 5 p Filed 2 Oct. 1969
(NASA-Case-LEW-10518-1; US-Patent-3,694,313; US-Patent-Appl-SN-863280; US-Patent-Class-176-11) Avail: US Patent Office CSCL 18H

Bombarding a tellurium target with a beam from an accelerator produces Xe-123, which is carried away by a flowing gas stream. Contaminants are removed from the gas, and the remaining xenon decays to I-123 which is ready for use as a radiopharmaceutical in which low radiation exposure is desired, as in diagnostic studies.
Official Gazette of the U.S. Patent Office

N72-33682*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ISOSINGLET APPROXIMATION FOR NONELASTIC REACTIONS
John W. Wilson Washington Oct. 1972 17 p refs
(NASA-TN-D-6942; L-8425) Avail: NTIS HC $3.00 CSCL 20H

Group theoretic relations are derived between different combinations of projectile and secondary particles which appear to have a broad range of application in spacecraft shielding or radiation damage studies. These relations are used to reduce the experimental effort required to obtain nuclear reaction data for transport calculations. Implications for theoretical modeling are also noted, especially for heavy-heavy reactions. Author

N72-33683# Utah Univ., Salt Lake City. Dept. of Physics.
ZENITH ANGLE AND DEPTH DEPENDENCE OF COSMIC RAY MUONS
H. E. Bergeson, G. W. Carlson, J. W. Keuffel, and J. L. Morrison 10 Sep. 1972 8 p refs Presented at the 16th Conf. on High Energy Phys. Sponsored by NSF
(UUCR-123) Avail: NTIS HC $3.00

The angular dependance of underground muons on pion and kaon decay is discussed along with the apparatus used to analyze such reactions. Results show satisfactory agreement with pion and kaon parentage for muons up to approxiamately 3 TeV. E.H.W.

N72-33684# Stanford Univ., Calif. Dept. of Physics.
NUCLEAR STRUCTURE INVESTIGATIONS WITH AN FN TANDEM ACCELERATION Progress Report, 1 Mar. 1971 - 29 Feb. 1972
Stanley S. Hanna and Walter E. Meyehof 1 Sep. 1972 188 p refs
(Grant NSF GP-8163-S3)
Avail: NTIS HC $11.50

Research on nuclear structure using the tandem Van de Graaff accelerator covered: (1) structure of light nuclei using unpolarized beams; (2) structure of light nuclei using polarized beams; (3) giant resonances with unpolarized capture reactions; (4) giant resonances with polarized capture reactions; (5) analog stages with polarized beams; (6) heavy ion reactions; (7) nuclear structure studies from Coulomb excitation and scattering;(8) lifetime measurements; (9) measurements of nuclear moments and Mossbauer studies; (10) polarized targets; and (11) polarized ion sources and target preparation. A.L.

N72-33685*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POPULATION INVERSION CALCULATIONS USING NEAR RESONANT CHARGE EXCHANGE AS A PUMPING MECHANISM
Donald L. Chubb and James R. Rose 1972 33 p refs Presented at the 25th Ann. Gaseous Electron. Conf., London, Ontario, 17-20 Oct. 1972
(NASA-TM-X-68143) Avail: NTIS HC $3.75 CSCL 20L

Near resonance charge exchange between ions of a large ionization potential gas such as helium or neon and vapors of metals such as zinc, cadmium, selenium, or tellurium has produced laser action in the metal ion gas. The possibility of obtaining population inversions in near resonant charge exchange systems (Xe-Ca, Xe-Mg, Xe-Sr, Xe-Ba, Ar-Mg, N-Ca) was investigated. The analysis is an initial value problem that utilizes rate equations for the densities of relevant levels of the laser gas (Ca, Ba, Mg, or Sr) and an electron energy equation. Electron excitation rates are calculated using the Bohr-Thomson approximation for the cross section. Approximations to experimental values of the electron ionization cross section and the ion-atom charge exchange cross section are used. Preliminary results have been obtained for the Ca-Xe system and show that it is possible to obtain gains greater than 10 to the 14th power/m with inversion times up to 8x10 to the minus 7th power second. A possible charge exchange laser system using a MPD arc plasma accelerator is also described. Author

N72-33686# Institute of Nuclear Research, Warsaw (Poland).
REGULARITIES IN THE FREE ENERGY CHANGES AND GENERAL TRENDS IN THE ENTHALPY AND ENTROPY TERMS FOR COMPLEXATION OF THE LANTHANIDE IONS WITH DIFFERENT LIGANDS
Irena Fidelis 1971 11 p refs Presented at Polish-Italian Seminar on Some Chem., Ceram., and Met. Aspects of Nucl. Fuels, Zakopane, Poland, 29 May - 2 Jun. 1970
(INR-P-1341; Conf-700540-2) Avail: AEC Depository Libraries

Regularities, observed in the separation factor in many complexing systems, are discussed. Thermodynamic data for complexation of lanthanide ions with different ligands were surveyed. Data for simple carboxylic, alpha-hydroxy, and polyaminopolycarboxylic acid, and organophosphorus ligands are considered. Four basic trends in the enthalpy changes were distinguished. These trends seem to be connected with steric hindrances rather than with the chemical nature of coordinating ligands. Author (NSA)

N72-33687# Atomic Energy Commission, New York. Health and Safety Lab.
ENVIRONMENTAL RADIATION IN THE CONTINENTAL UNITED STATES
Wayne M. Lowder and James E. McLaughlin Nov. 1971 20 p refs
(HASL-TM-71-21) Avail: NTIS

The observed radiation levels in populated areas are critically dependent on the radioactivity content of the upper layers of the soil, and radioactivity content of the building materials used for structures and roadway, the shielding effect of structures, the barometric pressure (which determines the cosmic radiation level), and the quantity of gamma-emitting radionuclides from fallout deposited on or in the ground. Given the possibilities for significant variations of any or all these factors over a small distance scale, it is evident that the quantitative characterization of the radiation environment of even a small town requires a considerable number of measurements. In particular, little value can be placed on a priori estimates of radiation levels for particular areas, based on typical figures for radioactivity concentractions in various media or for radiation levels measured elsewhere. Author (NSA)

N72-33688# Oak Ridge National Lab., Tenn.
RELATIVE IMPORTANCE OF NEUTRON CAPTURE AND INELASTIC-SCATTERING INTERACTIONS TO THE SECONDARY GAMMA-RAY DOSE TRANSMITTED THROUGH LAMINATED TUNGSTEN AND LITHIUM HYDRIDE SNAP REACTOR SHIELDS
J. V. Pace, III, F. R. Mynatt, and Lorraine S. Abbott 12 Apr. 1972 68 p refs Sponsored by AEC
(ORNL-TM-3270; CTC-41) Avail: NTIS

Calculations were made of the spatial and neutron energy dependence of the neutron captures and inelastic scatterings that contribute to the secondary gamma-ray dose transmitted through a laminated tungsten (Hevimet) and lithium hydride shield adjacent to a SNAP reactor. Four shield configurations were considered. Both a forward calculation and an adjoint calculation were performed with the one-dimensional discrete ordinates code ANISN, the forward calculation yielding neutron fluences within the shield and the adjoint calculation yielding probabilities that a gamma ray of a given energy orignating at a given position in the shield would contribute to the transmitted dose. The calculations show that in each configuration essentially all of the exit secondary gamma-ray dose is due to neutron interactions in the Hevimet, with the contribution from the last half of the Hevimet being a factor of 3 to 5 higher than that from the first half. Author (NSA)

N72-33689# General Electric Co., Sunnyvale, Calif. Breeder Reactor Dept.
FAST NEUTRON DAMAGE IN TYPE 304 STAINLESS STEEL AND HIGH NICKEL ALLOYS
D. W. Sandusky, P. J. Ring, and R. T. Penrose Dec. 1971 76 p

refs
(Contract AT(04-3)-189)
(GEAP-13738) Avail: NTIS

A materials capsule containing Incoloy-800, Hastelloy-X, Inconel-625 tensile specimens, electron microscopy disks, and a Type 304 stainless steel supporting strip was irradiated in EBR-2 to a peak fluence of 6.4 x 10 to the 22nd power n/sq cm over a temperature range of 750 to 1275 F. No voids formed in the Type 304 stainless steel irradiated at temperatures greater than 1200 + or - 25 F, but void size increased and number density decreased with increasing temperature of irradiation. No voids were found (zero swelling) in Inconel-625. Precipitation-strengthened alloys had higher ultimate strength and 0.2% yield strength after irradiation. All high nickel alloys exhibited reduced ductility after irradiation. Author (NSA)

N72-33690# Argonne National Lab., Ill.
REPORTS TO THE AEC NUCLEAR CROSS SECTIONS ADVISORY COMMITTEE MEETING
H. E. Jackson, comp. 19 Nov. 1971 280 p refs Meeting held at Brookhaven, N. Y., 17-19 Nov. 1971 Sponsored by AEC
(NCSAC-42; EANDC(US)-165-U; INDC(USA)-36-U; CONF-711137) Avail: NTIS

This material is of the nature of informal statements of recent developments and preliminary data. The following subjects are included: microscopic neutron cross sections relevant to the nuclear energy program, including pertinent inverse reactions; charged particle cross sections relevant to the nuclear energy program or to development and testing of nuclear models; gamma production, radioactive decay, and theoretical developments in nuclear structure applicable to nuclear energy programs; and proton and alpha cross sections up to 1 GeV of interest to the space program. NSA

N72-33691# Atomic Energy of Canada Ltd., Chalk River (Ontario).
PHYSICS DIVISION PROGRESS REPORT, 1 APRIL - 30 JUNE 1971
30 Jun. 1971 105 p refs
(AECL-3996; PR-P-90) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River: $2.00

Research in the areas of nuclear and solid state physics, solid state detectors, and mathematics and computers is briefly summarized. Publications, reports, and lectures during the period are listed. NSA

N72-33692# Institute of Nuclear Sciences, Lower Hutt (New Zealand).
[RADIOISOTOPE AND NUCLEAR PHYSICS RESEARCH] Progress Report, Jan. - Jun. 1971
Sep. 1971 121 p refs
(INS-504; PR-17) Avail: AEC Depository Libraries

Brief summaries of research projects on accelerators, instrumentation, experimental nuclear physics, NMR, cosmic radiation, radiation sources, radiation chemistry, radiation applications in industry, stable isotope geochemistry, radioactive dating and fallout, isotope applications, and electronic and mechanical equipment are given. Publications issued during the period are listed. NSA

N72-33693# Harry Diamond Labs., Washington, D.C.
NUCLEAR ELECTROMAGNETIC PULSE SIMULATION BY DIPOLE ANTENNA ARRAY TECHNIQUES Technical Report, 9 Mar. - 30 Nov. 1971
Janis Kiebers and George D. Crowson Apr. 1972 37 p refs
(AD-744773; HDL-TM-72-9) Avail: NTIS CSCL 18/3

Time-domain dipole antenna array studies conducted at the Electromagnetic Effects Laboratory of the Harry Diamond Laboratories for application to large scale nuclear electromagnetic pulse (EMP) simulation are described. Analytically and experimentally derived EMP environments for a single-dipole antenna are compared with corresponding data for multiple element broadside and collinear dipole antenna arrays. The multiple-element concept is studied as a technique for eliminating the need for extremely high voltages in the single element-type nuclear EMP simulators by substituting the superimposed electromagnetic fields radiated by several lower voltage sources to obtain the equivalent EMP environment. Experimentally measured input impedances are compared with the results from classical antenna theory to determine the effects of mutual coupling between elements in the array configurations. Author (GRA)

N72-33694# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ABSORPTION EFFECT OF THE US NUCLEAR TEST OF 9 JULY 1962 ON THE HF LINE NORDDEICH-NEUSTRELITZ
P. Nitzsche 28 Apr. 1972 15 p refs Transl. into ENGLISH from Z. Meteorol. (East Germany), v. 18, no. 8, 1966 p 384-388
(AD-743662; FTD-HT-23-1295-71) Avail: NTIS CSCL 18/3

The article discusses the absorption phenomena related to the U.S. high-altitude nuclear detonation carried out over the Johnston Islands in the Pacific on 9 July 1962 (Operation Starfish). The absorption effects analyzed in the paper were recorded and measured on a 2614-MHz transmission line running from Norddeich to Neustrelitz in North Germany. The Starfish detonation, in the 1/4 megaton range, occurred at an altitude of 400 km, giving rise to very severe absorption effect anomalies. The author considers such aspects of the problem as VLF phase disturbances, the role of X-ray and gamma radiation as a cause of ionization, eastward drift speed of trapped beta-particles, flare phenomenon, SEA and SID effect, decibel attenuation data. An effort is made toward a physical interpretation of the data base obtained with the movement of the HF particles in the geomagnetic dipole field considered in the first approximation. Author (GRA)

N72-33695# R and D Associates, Santa Monica, Calif.
A SIMPLE MODEL OF SOFT X-RAY PHOTOEMISSION
Richard R. Schaefer Nov. 1971 23 p refs
(Contract DASA01-71-C-0103)
(AD-744992; RDA-TR-036-DNA) Avail: NTIS CSCL 20/3

In order to evaluate some of the features of the electromagnetic response of space systems to pulsed, plane wave photon environments, it is necessary to understand the intensity, energy spectrum, and angular distribution of the electron emission current. For a realistic application, the electron emission spectrum and angular distribution can be found by convolving the incident photon spectrum with the electron yield as a function of photon energy. This electron yield, which expresses the number of electrons emitted from a surface per incident photon, can be expected to vary with angle of photon incidence and material composition as well as with photon energy. Soft X-rays contribute to electron emission primarily through photoelectric interactions and the electron yield for soft X-rays will be referred to here as the photoelectric yield. In this paper, a simple model of the photoelectric yield is proposed and predictions based upon the model are compared with published experimental data. Furthermore, simple expressions for the electron emission current for arbitrary incident photon fluxes are derived for the higher energy electron components. Author (GRA)

N72-33812* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPRATHERMAL PROTON BREMSSTRAHLUNG
Frank C. Jones *In its* Significant Accomplishments in Sci., 1971 p 155-159 refs (For availability see N72-33780 24-30)
CSCL 20H

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N72-33696* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC DUST OR OTHER SIMILAR OUTER SPACE PARTICLES IMPACT LOCATION DETECTOR Patent
Siegfried O. Auer, inventor (to NASA) Issued 26 Sep. 1972 8 p Filed 29 Dec. 1970 Supersedes N71-29183 (09 - 16, p 2663)
(NASA-Case-GSC-11291-1; US-Patent-3,694,655; US-Patent-Appl-SN-102412; US-Patent-Class-250-83.6R) Avail: US Patent Office CSCL 20I

A system for detecting the impact position of cosmic dust and other similar outer space particles on a detector surface includes means for forming an ionized stream in response to impact of a particle. The ionized stream is collected by one of a number of mutually insulated, metal electrode strips. A number of series connected capacitors is provided, with taps between adjacent capacitors being connected to a different one of each of the strips. Each end terminal of the series circuit formed by the capacitors is connected to input terminals of amplifiers which drive circuitry to indicate the strip on which the particle impacted. To prevent the plasma stream from impinging on a strip other than the strip in closest proximity to the source of the stream, shield walls are provided along the edges of the strips.
Official Gazette of the U.S. Patent Office

N72-33697# United Kingdom Atomic Energy Authority, Culham (England).
CONTAINMENT OF AN OHMIC HEATING PLASMA IN THE URAGAN HIGH-SHEAR STELLARATOR
V. N. Vishnevetskii, E. D. Volkov, A. G. Dikii, V. M. Zalkind et al Feb. 1972 9 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. Russ. Ed. (Kiev), v. 16, no. 5, 1971 p 751-756
(CTO/808) Avail: AEC Depository Laboratories

Investigations of ohmic-heated plasma confinement in a stellarator with high shear are discussed. It is shown that the confinement time relative to the Bohm value increases with the shear growth and rotational transform. For a shear of about 0.085 the relative confinement time is about 30 tau sub B (tau sub B is the Bohm time). The experimental data are in satisfactory agreement with the theory. Author (NSA)

N72-33698# Academy of Sciences (USSR), Moscow. Fizicheskii Inst.
DETERMINATION OF PLASMA DENSITY IN STELLARATORS USING AN OPEN MICROWAVE RESONATOR
D. K. Akulina, Yu. I. Nechaev, V. Ya. Sudenkov, and O. I. Fedyanin 1972 6 p refs In RUSSIAN
(NP-19284; Preprint-25) Avail: AEC Depository Libraries

Measuring resonators with high Q must be used in the measurement of plasma density in a wide range. Fabry-Perot-type open microwave resonators possess the required characteristics, but their use in stellarators encounters difficulties associated with resonator placement within the chamber without constricting its aperture. This and similar problems were satisfactorily solved for the measurement of plasma densities, and also for the measurement of resonance frequency shift. The apparatus for these measurements is diagrammed and discussed. NSA

N72-33699# Oak Ridge National Lab., Tenn.
INVESTIGATION OF THE TEMPERATURE DISTRIBUTION IN THE LITHIUM BLANKET OF A FUSION REACTOR
S. J. Leverette May 1972 67 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3701) Avail: NTIS

A numerical study was made of the effects of a strong magnetic field on the heat transfer capabilities of flowing liquid lithium in the blanket of a Tokamak fusion reactor. The temperature distributions in the blanket were calculated for a series of idealized cases assuming zero eddy diffusivity so that all heat transfer is by conduction. The results show that lithium is suitable as a coolant from the viewpoint of heat transfer and heat transport requirements even with slow velocities and thick passages for a vacuum wall power loading of around 1 MW/sq m. The feasibility of using higher power loadings depends on magnetohydrodynamic pumping power requirements and thermal stress problems. Calculations were made for a proposed experiment to study these effects and check the analysis in a closed lithium loop. Author

N72-33700# Addis Translations International, Woodside, Calif.
OBSERVED X-RAY LINES OF HIGHLY IONIZED IRON IN LASER PLASMA
E. V. Aglitskii, V. A. Boika, S. M. Zakharov, G. V. Sklizkov, and A. N. Fedorov Apr. 1972 7 p refs Transl. into ENGLISH from Kratk. Soobshch, Fiz. (USSR), no. 12, 1971 p 36-40 Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab. Sponsored by AEC
(UCRL-Trans-10610) Avail: NTIS

The use of a laser and an X-ray tube for production and diagnostics of a plasma with electron temperature of approximately 1,000 eV is described. A spectrogram was obtained which contained nearly 40 lines of highly ionized Fe in the region 10 to 16 A. NSA

N72-33701# Addis Translations International, Woodside, Calif.
SPECTRA OF Sc XIV AND Sc XV EMITTED BY LASER PLASMA IN THE 100 TO 200 A REGION
V. A. Boiko, Yu. P. Voinov, P. I. Ivashkin, and G. V. Sklizkov Apr. 1972 7 p refs Transl. into ENGLISH from the Russian preprint no. 4 Prepared for Calif. Univ., Livermore. Lawrence Livermore Lab. Sponsored by AEC
(UCRL-Trans-10609) Avail: NTIS

Measurements and identification of 24 spectral lines between 100 and 200 A from scandium plasma generated by focusing laser radiation on the surface of a solid target are reported. The transitions identified are 2s2 2p3-2s2 p4 in Sc 15 and 2s2 2p4-2s2 p5 in Sc 14. Author (NSA)

N72-33702# Institut fuer Plasmaphysik G.m.b.H., Garching (West Germany).
DETERMINATION OF THE MAGNETIC FIELD B IN VACUUM FOR GENERAL TWO-DIMENSIONAL MHD EQUILIBRIA
W. Kerner, D. Pfirsch, and H. Tasso Feb. 1972 10 p refs
(IPP-6/103) Avail: AEC Depository Libraries

For general two-dimensional MHD equilibria it is possible, using complex functions, to obtain the solution of the vacuum magnetic field that fits the boundary conditions at the plasma surface. The solution allows a distinction between the geometry governed and plasma magnetic field governed singularities and stagnation points. Several examples, particularly the elliptic plasma boundary case, are discussed. Author (NSA)

N72-33703# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Sukumi (USSR). Fiziko-Tekhnicheskii Inst.
THEORY OF HYDRODYNAMIC STABILITY OF PLASMA IN THE FIELD OF AN ALFVEN WAVE OF FINITE AMPLITUDE
A. G. Elfimov and F. M. Nekrasov 1971 27 p refs In RUSSIAN
(NP-19260) Avail: AEC Depository Libraries

The stability of a plasma located in the field of a self-consistent Alfven wave is investigated, and the decay instability for a plasma with beta much greater than 1 is examined. The increments and zone width of instability and the critical wave amplitude are found. The problem is solved for both stationary and moving Alfven waves, and a difference is revealed between decay instability and parametric instability in a

homogeneous high frequency field. An instability associated with Alfven wave scattering is found, conditions for excitation of which are less rigorous than conditions for excitation of decay instability. Author (NSA)

N72-33704# Academy of Sciences (USSR), Moscow.
NONTHERMAL RADIATION OF MAGNETOACTIVE PLASMA IN A FIELD OF ULTRAHIGH FREQUENCY WAVE PUMPING
G. M. Vatanov and K. A. Sarksyan 1971 16 p refs In RUSSIAN
(NP-19255) Avail: AEC Depository Libraries

Ultrahigh frequency radiation from a collisionless, magnetized plasma was experimentally investigated during its interaction with a high-power pumping wave in the ultrahigh frequency range. Red and blue satellites were observed in the spectrum of radiation in the first harmonic of the pumping wave and were displaced relative to the central peak. Radiation at the second harmonic of the pumping wave was detected, the intensity increasing exponentially with the power of the incident wave. During interaction of the plasma with the high-power wave of first harmonic frequency nonlinear gain of weak signals was observed with frequencies close to the second harmonic. The effects of satellite excitation were noted. Radiation at the second harmonic of the pumping wave was correlated with the effects of anomalous absorption and heating and were interpreted as parametric excitation of plasma oscillations. Author (NSA)

N72-33705# Technische Hochschule Hannover (West Germany). Inst. fuer Plasmaphysik.
EXPERIMENTAL INVESTIGATION OF THE CONTINUOUS EMISSION OF SHOCK HEATED KRYPTON AND XENON PLASMAS [UNTERSUCHUNG DER EMISSIONSKONTINUA VON KRYPTON UND XENON AN STOSSWELLENPLASMEN]
W. Weber Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Jul. 1972 114 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-K-72-08) Avail: NTIS; Zentralstelle fuer Atomkernenergie-Dokumentation (ZAED), Leopoldshafen, West Ger., 23,10 DM

The emission coefficients for continuum radiation of shock heated krypton and xenon plasmas were measured photographically in the wavelength region from 4,000 to 6,000 Angstrom and the xi-factors for Kr 1 and Xe 1 were determined. The plasma temperature and electron density needed for the calculation of the xi-factors were calculated from the velocity of the shock wave with the Rankine Hugoniot equations. The results are compared with measurements and theoretical calculations of other authors. Author (ESRO)

N72-33706# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
PRELIMINARY RESULTS OF PLASMA ELECTRON COMPONENT INVESTIGATIONS ALONG THE ORBIT OF THE SATELLITE OF MARS
K. I. Gringauz, V. V. Bezrukikh, G. I. Volkov, T. K. Breus, L. S. Musatov, L. P. Havkin, and G. F. Sloutchenkov 1972 12 p refs
(D-140) Avail: NTIS HC $3.00

Preliminary results of electron temperature and density measurements along the orbits of the Mars 2 and 3 spacecraft are given. The measurements show the existence of regular and repeated variations of temperature and density up to 100,000 km from the planet which seem to correspond to the shock wave front region formed when the solar wind interacts with the planet. Author (ESRO)

N72-33707# Naval Research Lab., Washington, D.C.
THEORY OF TURBULENT PLASMA HEATING BY ANOMALOUS ABSORPTION OF MAGNETOSONIC WAVES
John B. McBride, Edward Ott, and Carl E. Wagner Jun. 1972 19 p refs
(AD-744652; NRL-MR-2450) Avail: NTIS CSCL 20/9

Theory and computer simulation experiments have shown the potential importance of the fluid-like, modified two stream instability as an ion heating mechanism in low beta plasmas. In order to take advantage of the strong ion heating which it can produce, the authors consider inducing the instability with large amplitude waves in order to convert the energy in the wave fields into ion thermal energy. Since the instability is driven by relative electron-ion drifts across a magnetic field B(o), and has a frequency comparable to the lower hybrid frequency (omega sub LH) a natural choice for the driver wave is a magnetosonic wave which propagates across B(o) near the Alfven speed. As a specific example, the authors demonstrate that for the parameters of the Princeton ST-Tokamak it is theoretically possible to achieve thermonuclear temperatures by anomalously absorbing these waves via the modified two stream instability. Author (GRA)

N72-33708# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
LINEARIZED THEORIES OF IONIZATION WAVES M.S. Thesis
Robert S. McCulloch Jun. 1972 52 p refs
(AF Proj. 7071)
(AD-744815; GEP/PH/72-13) Avail: NTIS CSCL 20/9

A model for ionization waves in a dc gas discharge is developed in a straightforward manner based on the linearized first three moment equations for positive ions and electrons and Poisson's equation. Slab symmetry is imposed. The predictions obtained by applying this model to discharge conditions for which ionization waves have been observed are in good qualitative agreement with both the results of experiment and the predictions of other theories. The effects of including small perturbations in ion temperature and electron neutral momentum transfer collision frequency and energy transfer collision frequency are also discussed. Author (GRA)

N72-33709# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THEORETICAL CALCULATION OF X-RADIATION FROM NONEQUILIBRIUM ALUMINUM PLASMAS M.S. Thesis
Robert W. Boyd Jun. 1972 90 p refs
(AF Proj. 8809CF)
(AD-744813; GEP/PH/72-1) Avail: NTIS CSCL 20/9

TORCH, a computer code which calculates the spectrum arising from the radiation of a metallic plasma, is described. The population of each ionic species is determined from a time-dependent corona model which includes three-body recombination. Both time-resolved and time-integrated spectra are obtained, showing the contributions from bremsstrahlung, recombination radiation, and line radiation. Ion and electron temperatures are allowed to differ, with radiative losses causing continuous electron cooling. Energy may be added to the electrons and/or ions at arbitrary rates, for arbitrary times, and TORCH will compute the temperatures based on the rates of radiation, ionization, and electron-ion energy exchange. Calculations are included for aluminum plasmas with electron densities of 10 to the power of 18 to 10 to the power of 21/CC and electron temperatures of 10 eV to several KeK. Also included are calculations of radiation from a deuterium plasma with 5% aluminum impurities. Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N72-33710*# Linfield Research Inst., McMinnville, Oreg.
WORK FUNCTION MEASUREMENTS BY THE FIELD EMISSION RETARDING POTENTIAL METHOD Final Report
L. W. Swanson, R. W. Strayer, and W. A. Mackie Dec. 1971 51 p refs
(Grant NGR-38-010-001)
(NASA-CR-128370) Avail: NTIS HC $4.75 CSCL 20L

Using the field emission retarding potential method true work functions have been measured for the following monocrystalline substrates: W(110), W(111), W(100), Nb(100), Ni(100), Cu(100), Ir(110) and Ir(111). The electron elastic and inelastic reflection coefficients from several of these surfaces have also been examined near zero primary beam energy.
Author

N72-33711*# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
FORECASTING OF THE PERFORMANCE OF MOS DEVICE FOR SPACE APPLICATIONS Final Report
P. H. Fang 1971 23 p refs
(Grant NGR-22-003-019)
(NASA-CR-130060) Avail: NTIS HC $3.25 CSCL 20L

Analysis of radiation damage of MOSFET data from Explorer 34 (IMP-F), and radiation damage characteristics of MOSFET with boron diffused between a silicon semiconductor and silicon oxide are considered. The first subject is an interpretation of the discrepancy between the space data and the laboratory data. The second subject is an attempt to analyze the radiation damage characteristic of MOSFET when there is modification of electrical properties in the gate oxide region.
Author

N72-33712*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THEORETICAL DETERMINATION OF CESIATED WORK FUNCTIONS
R. M. Szejn 15 Sep. 1972 19 p refs
(Contract NAS7-100)
(NASA-CR-128339; JPL-TM-33-565) Avail: NTIS HC $3.00 CSCL 20L

A computer program based on the theoretical work of Gyftopoulos, Steiner, and Levine on bimetallic systems and using a modified version of Wilkins' SIMCON subroutine SURFAS was written for the Univac 1108. This program, WFGSL, accepts the operating conditions and the physical parameters pertinent to the substrate and adsorbate, and outputs the field-free work function, electron current (Richardson equation), ion current (Saha equation), and fractional substrate coverage by the adsorbate. A brief description of the theory is presented together with a program description and listing. An application of the program to a bimetallic system of cesium (adsorbate) and rhenium (substrate) is also described.
Author

N72-33713*# Purdue Univ., Lafayette, Ind. Thermophysical Properties Research Center.
HANDBOOK OF THE OPTICAL, THERMAL AND MECHANICAL PROPERTIES OF SIX POLYCRYSTALLINE DIELECTRIC MATERIALS
D. P. DeWitt Sep. 1972 247 p refs
(Contract NAS2-6802)
(NASA-CR-114500; TPRC-19) Avail: NTIS HC $14.50 CSCL 20B

The design data for six polycrystalline dielectric materials are presented to describe the optical, thermal, and mechanical properties. The materials are aluminum oxide, calcium fluoride, magnesium fluoride, magnesium oxide, silicon dioxide, and titanium dioxide. The primary interest is in the polycrystalline state, although single crystal data are included when appropriate. The temperature range is room temperature to melting point. The wavelength range is from near ultraviolet to near infrared.
Author

N72-33714# Boston Univ., Mass. Dept. of Physics.
INVESTIGATION OF ORGANIC SEMICONDUCTOR FOR PHOTOVOLTAIC APPLICATION Interim Report, 1 Jan. - 31 Dec. 1971
P. H. Fang and Shyh-Shyong Hsu 10 Mar. 1972 57 p refs
(Contract F19628-71-C-0093; AF Proj. 8659)
(AD-745591; AFCRL-72-0209; SR-1) Avail: NTIS CSCL 20/12

Four areas of research are discussed concerning the photovoltaic properties of tetracene and other organic material solar cells: Photovoltaic current voltage curve; Transient photovoltaic effects in tetracene; Spectral response of transent photovoltaic currents; and Solar cell configurations.
GRA

N72-33715# Sandia Labs., Albuquerque, N.Mex.
METHOD TO DETERMINE THE RELATIVE DAMAGE PRODUCED IN SEMICONDUCTORS BY DIFFERENT NEUTRON SOURCES
James M. McKenzie 6 Dec. 1971 48 p refs Sponsored by AEC
(SC-M-720133) Avail: NTIS

A specification is presented which provides a method to describe a neutron radiation environment for semiconductors. The neutron environment is described in terms of a fluence of 14 MeV neutrons. The specification establishes how to measure the fluence of the 14 MeV neutrons and discusses the way to relate the damage of the 14 MeV neutrons to damage from neutrons in an unknown spectral distribution.
NSA

N72-33716# Electronic Systems Div., Bedford, Mass. Scientific and Technical Information Div.
PROGRESS IN ELECTRONIC SYSTEMS RESEARCH AND DEVELOPMENT TECHNOLOGY (1970): AN ANNOTATED BIBLIOGRAPHY OF ESD TECHNICAL REPORTS Bibliography Report, Jan. - Jun. 1970
Henry F. Szemplinski May 1972 68 p refs
(AD-745202; ESD-TR-72-149) Avail: NTIS CSCL 20/12

The semi-annual annotated ESD bibliography includes an abstract and the AD citation number.
Author (GRA)

N72-33717# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADVANCED ELECTRONIC TECHNOLOGY Quarterly Technical Summary, 1 Feb. - 30 Apr. 1972
Melvin A. Herlin and Alan L. McWhorter 15 May 1972 23 p
(Contract F19628-70-C-0230; AF Proj. 649)
(AD-745203; ESD-TR-72-108) Avail: NTIS CSCL 20/12

The summary covers the period 1 February through 30 April 1972. It consolidates the reports of Division 2 (Data Systems) and Division 8 (Solid State) on the Advanced Electronic Technology Program of the Lincoln Laboratory, MIT.
GRA

N72-33718# Radio Corp. of America, Princeton, N.J.
CONDUCTION MECHANISMS FOR ELECTRONIC DEVICES Final Report, 3 May 1971 - 2 May 1972
David Redfield and Isaac Balberg Jun. 1972 87 p refs
(Contract N00014-71-C-0371)
(AD-744708; PRRL-72-CR-26) Avail: NTIS CSCL 20/12

Controllable electronic energy band tails have been prepared in heavily doped, closely compensated GaAs. Their properties are found to correspond in many ways with the reported properties of amorphous semiconductors. The control now over the occupation of the band tail states permits observation of the energy dependence of various transport properties, (temperature dependence of the d.c. conductivity, frequency dependence of the a.c. conductivity and current-voltage relations). Possible applications are discussed. The electronic properties of Fe3O4 and VO2 are also studied. The possibility of switching due to dissociation of polarons was examined theoretically as well as experimentally using oxygen-reduced TiO2.
GRA

N72-33719# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Physics.
MAGNETIC PHASES IN A TWO DIMENSIONAL ANTIFERROMAGNET
W. T. Oosterhuis and J. P. Stampfel Jun. 1972 3 p Sponsored in part by NSF
(Contract N00014-67-A-0314-0005; NR Proj. 018-304)
(AD-744709; TR-21) Avail: NTIS CSCL 20/12

Mossbauer effect experiments on single crystal FeCl3 (anhydrous) show the hyperfine field to vary with temperature, which is indicative of two-dimensional magnetic ordering. Further experiments show a spin reorientation for fields of about 40 kiloOersted applied along the c-axis. The boundaries of the magnetic phases in the H-T plane are determined. Author

N72-33720# Army Electronics Command, Fort Monmouth, N.J.
THE EFFECT OF ADSORBED WATER ON THE SURFACE PHOTOVOLTAGE OF GaAs
M. J. Katz, D. C. Fox, and K. J. Haas 24 Sep. 1971 5 p refs Repr. from Surface Sci. (Netherlands), v. 28, 1971 p 627-631
(AD-744580) Avail: NTIS CSCL 20/12

It is well known that ambients can have a marked influence on the surface photovoltage the change in surface potential with illumination. The sensitivity of the surface photovoltage to ambients has been studied by the authors for some of the chalcogenides, and by Flinn and Briggs for the case of GaAs. However, a definitive model for the dependence of the surface photovoltage on the ambient is not yet available. The purpose of this report is to present experimental results that have a bearing on this problem. Author (GRA)

N72-33721# International Business Machines Corp., Hopewell Junction, N.Y. East Fishkill Lab.
CRYSTAL PROPERTIES AS INFLUENCED BY CRYSTALLOGRAPHIC IMPERFECTIONS Final Report, 1 Jan. - 31 Dec. 1971
Guenter H. Schwuttke 15 Feb. 1972 119 p refs
(Contract F19628-71-C-0095; AF Proj. 5621)
(AD-743935; AFCRL-72-0176) Avail: NTIS CSCL 20/12

High-energy ion implantation into silicon and the formation of defect structures in silicon after implantation and after annealing is investigated. Specifically, annealing properties of amorphous layers properties of amorphous layers produced by 1 MeV C(-) and Si(-) implantations are studied. Detailed investigations of the damage and ion profiles before and after annealing are presented. It is shown that high-energy silicon bombardment of silicon can produce amorphous isolation regions in silicon and that the insulating properties of such isolation regions are stable for annealing temperatures up to 500 C. Precision lattice parameter measurements made on ion-implanted silicon are reported. Double-crystal diffractometer measurements on ion-bombarded silicon are reported.
Author (GRA)

N72-33722# Northern Illinois Univ., Dekalb. Dept. of Physics.
ELECTRICAL AND OPTICAL PROPERTIES OF AMORPHOUS MATERIALS Semiannual Technical Report
Charles Wood 1972 104 p refs
(Contract DA-ARO(D)-31-124-71-G132; ARPA Order 1562)
(AD-744698; SATR-4) Avail: NTIS CSCL 20/12

The electronic structure of Sb2Se3, both crystalline and amorphous, has been studied and the combination of four types of spectroscopy (optical reflectivity, photoemission, photoconductivity, and ESCA) has led to a reasonably complete picture of the electronic structure. Resistivity vs. temperature measurements, differential thermal analysis measurements, measurements (photoconductivity, photoemission, optical transmission and reflectivity), and finally Mossbauer spectroscopy are being initiated on amorphous Sb, Sb2Te3, Sb2Se3 and Sb2S3 (both crystalline and amorphous) in order to obtain information about the chemical and electronic structure of the amorphous state of these materials. GRA

N72-33723# Maryland Univ., College Park. Dept. of Electrical Engineering.
THE STUDY OF THE INTERACTION OF INTENSE PICOSECOND LIGHT PULSE WITH MATERIALS Quarterly Technical Report, 21 Dec. 1971 - 21 Mar. 1972
Chi H. Lee and Young Ho Park 1 May 1972 64 p refs
(Grant DA-ARO(D)-31-124-71-G55; ARPA Order 675)
(AD-743517; TR-9) Avail: NTIS CSCL 20/12

Laser action in GaAs using a Nd: glass laser as a two photon pump was investigated. External mirrors were employed to form the optical cavity. Laser action in GaAs was observed in the following experiments: Firstly, the authors observed a narrowing of the emission spectrum. Secondly, the authors examined the output power dependence upon the input power, and measured the threshold power. The main advantage of this method of optical excitation is the possibility of obtaining an inverse population throughout a large semiconductor volume. The advantage of using an external mirror resonator is that it may be possible to Q-switch the GaAs laser and to use the adjustable cavity for various other purposes. Author (GRA)

N72-33724# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
MICROSTRUCTURE OF POWDER AND CONVENTIONALLY PROCESSED 7075 ALUMINUM ALLOY Final Report, Sep. 1969 - Jun. 1971
L. A. Jacobson, C. M. Pierce, and M. M. Cook Dec. 1971 29 p refs
(AF Proj. 7351)
(AD-744845; AMRL-TR-71-240) Avail: NTIS CSCL 20/2

Aluminum alloy powder of the 7075 composition was consolidated by warm upset and extrusion. Commercial cast and wrought material was also extruded to serve as a control. Results of varying the length of time at solution treatment temperature indicate that the powder material is far less resistant to recrystallization than the conventional material. Optical and transmission electron microscopy revealed that after identical post-extrusion solution treatments the substructure formed during extrusion throughout the commercial material was stable while the powder material retained substructure only near the edges of the rectangular extrusion and had undergone complete recrystallization toward the center. Author (GRA)

N72-33725# Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy and Materials Science.
ON THE ROLE OF SURFACE OXIDE IMPURITIES IN THE KNEE EFFECT IN SUPERCONDUCTING TUNNEL JUNCTIONS
Myron H. Fremmer, Margaret L. A. MacVicar, and Robert M. Rose 12 Jun. 1972 23 p refs
(Contract N00014-67-A-0204-0041)
(AD-745011; TR-7) Avail: NTIS CSCL 20/12

The authors present a qualitative model based on the effect of impurity states in the barrier to explain the anomalous knee in the I-V characteristics of superconducting tunnel junctions, they have experimentally confirmed the temperature dependence predicted by the model, and have been able to reproducibly control the appearance, disappearance and the severity of the anomaly by controlled junction fabrication. The junctions were made by evaporating thin films on to the oxidized surfaces of Nb single crystals which had been grown in ultra-high vacua by the floating zone technique. The authors report that control of impurities in the barrier itself (rather than surface effects at the metal-oxide interface) according to the model can completely control the appearance of the anomaly. Author (GRA)

N72-33726# Army Electronics Command, Fort Monmouth, N.J.
THE COEFFICIENTS OF SECOND HARMONIC GENERATION OF LIGHT (SHG) OF NONCENTROSYMMETRIC CRYSTALS
R. Bechmann and A. Ballato May 1972 21 p refs
(DA Proj. 1S6-62705-A-058)
(AD-745095; ECOM-3529) Avail: NTIS CSCL 20/6

The piezoelectric and SHG effects, both described by a second-order matrix and denoted by the same symbol, are independent of each other. They are defined differently, however, and for the triagonal and hexagonal crystal classes lead to incorrect schemes for the SHG effect when the definition for the piezoelectric d matrix is used. It is shown how the correct SHG matrices may be derived from the well-known piezoelectric matrices. Some recent values for the SHG coefficients are given. Author (GRA)

N72-33727# Rice Univ., Houston, Tex. Materials Science Lab.
MAGNETOELASTIC PROPERTIES OF RARE-EARTH ELEMENTS AND COMPOUNDS Semiannual Report, 5 Nov. 1971 - 4 May 1972
Paul L. Donoho, Franz R. Brotzen, Kamel Salama, and L. V. Benningfield, Jr. 4 Jun. 1972 118 p refs
(Contract DAAH01-72-C-0285; ARPA Order 1685)
(AD-745410) Avail: NTIS CSCL 20/12

The report describes the technical accomplishments attained during the third six-month period of a research program on the magnetic and magnetoelastic properties of rare-earth elements, alloys, and compounds. The research carried out during the period covered by this report has been concentrated in three major areas; studies on elastic-wave propagation in terbium at frequencies in the megahertz range have shown the existence of very strong field-induced acoustic birefringence in single-crystal speciments., magnetostrictive ultrasonic transducers in the form of thin polycrystalline films have been constructed using several pure rare-earth elements and a terbium-iron compound, a semiclassical theory of magnetoelastic interactions in rare-earth materials, which is based on an equation-of-motion approach to the dynamical behavior of magnetic materials, has yielded results which are applicable to both the two preceding areas of research and which, in particular, should make possible the design of more efficient microwave ultrasonic transducers. GRA

N72-33728# New South Wales Univ., Kensington (Australia). School of Physics.
ELECTRON PARAMAGNETIC RESONANCE STUDY OF GaAs SURFACES Annual Report, 1 Feb. 1971 - 31 Jan. 1972
D. Haneman Apr. 1972 46 p refs
(Grant DA-CRD-AFE-S92-544-71-G168)
(AD-745220; ARDG(FE)-4404; AR-4) Avail: NTIS CSCL 20/12

The authors describe new experimental arrangements for extending EPR measurements on single crystal cleavage surfaces in UHV down to low temperatures, for GaAs studies. This development is necessary to gain the extra sensitivity which is essential when dealing with the very low signals obtained from relatively low area single crystals. In addition, EPR measurements of other diamond structure semiconductor surfaces have been made. These include the clean and oxygen covered surfaces of Ge, CdS, CdSe, ZnSe, PbS, PbTe, and a full range of Ge - Si alloys, studied by crushing in ultra high vacuum. GRA

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N72-33729*# National Aeronautics and Space Administration, Washington, D.C.
LIQUID PROPELLANT ROCKET COMBUSTION INSTABILITY
David T. Harrje 1972 659 p refs
(NASA-SP-194) Avail: NTIS; SOD $5.50 CSCL 21I

The solution of problems of combustion instability for more effective communication between the various workers in this field is considered. The extent of combustion instability problems in liquid propellant rocket engines and recommendations for their solution are discussed. The most significant developments, both theoretical and experimental, are presented, with emphasis on fundamental principles and relationships between alternative approaches. Author

N72-33730*# Rocketdyne, Canoga Park, Calif.
SPACE STORABLE PROPELLANT PERFORMANCE GAS/LIQUID LIKE-DOUBLET INJECTOR CHARACTERIZATION
A. Y. Falk Oct. 1972 211 p refs
(Contract NAS3-12051)
(NASA-CR-120935; R-8973-1) Avail: NTIS HC $12.75 CSCL 21I

A 30-month applied research program was conducted, encompassing an analytical, design, and experimental effort to relate injector design parameters to simultaneous attainment of high performance and component (injector/thrust chamber) compatibility for gas/liquid space-storable propellants. The gas/liquid propellant combination selected for study was FLOX (82.6% F2)/ambient temperature gaseous methane. The injector pattern characterized was the like-(self)-impinging doublet. Program effort was apportioned into four basic technical tasks: injector and thrust chamber design, injector and thrust chamber fabrication, performance evaluation testing, and data evaluation and reporting. Analytical parametric combustion analyses and cold flow distribution and atomization experiments were conducted with injector segment models to support design of injector/thrust chamber combinations for hot fire evaluation. Hot fire tests were conducted to: (1) optimize performance of the injector core elements, and (2) provide design criteria for the outer zone elements so that injector/thrust chamber compatibility could be achieved with only minimal performance losses. Author

N72-33731*# Rocketdyne, Canoga Park, Calif.
SPACE STORABLE PROPELLANT PERFORMANCE PROGRAM COAXIAL INJECTOR CHARACTERIZATION
R. J. Burick Oct. 1972 223 p refs
(Contract NAS3-12051)
(NASA-CR-120936; R-8973-2) Avail: NTIS HC $13.25 CSCL 21I

An experimental program was conducted to characterize the circular coaxial injector concept for application with the space-storable gas/liquid propellant combination FLOX(82.6% F2)/CH4(g) at high pressure. The primary goal of the program was to obtain high characteristic velocity efficiency in conjunction with acceptable injector/chamber compatibility. A series of subscale (single element) cold flow and hot fire experiments was employed to establish design criteria for a 3000-lbf (sea level) engine operating at 500 psia. The subscale experiments characterized both high performance core elements and peripheral elements with enhanced injector/chamber compatibility. The full-scale injector which evolved from the study demonstrated a performance level of 99 percent of the theoretical shifting characteristic exhaust velocity with low chamber heat flux levels. A 44-second-duration firing demonstrated the durability of the injector. Parametric data are presented that are applicable for the design of circular, coaxial injectors that operate with injection dynamics (fuel and oxidizer velocity, etc.) similar to those employed in the work reported. Author

N72-33732*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
DETERMINATION OF SOLID-PROPELLANT TRANSIENT REGRESSION RATES USING A MICROWAVE DOPPLER SHIFT TECHNIQUE
Leon D. Strand, August L. Schultz, and Gary K. Reedy 15 Oct. 1972 45 p refs
(Contract NAS7-100)
(NASA-CR-128379; JPL-TR-32-1569) Avail: NTIS HC $4.25 CSCL 21I

A microwave Doppler shift system, with increased resolution over earlier microwave techniques, was developed for the purpose of measuring the regression rates of solid propellants during rapid pressure transients. A continuous microwave beam is transmitted to the base of a burning propellant sample cast in a metal waveguide tube. A portion of the wave is reflected from the regressing propellant-flame zone interface. The phase angle difference between the incident and reflected signals and its time differential are continuously measured using a high resolution microwave network analyzer and related instrumentation. The apparent propellant regression rate is directly proportional to this latter differential measurement. Experiments were conducted to verify the (1) spatial and time resolution of the system, (2) effect of propellant surface irregularities and compressibility on the measurements, and (3) accuracy of the system for quasi-steady-state regression rate measurements. The microwave system was also used in two different transient combustion experiments: in a rapid depressurization bomb, and in the high-frequency acoustic pressure environment of a T-burner. Author

N72-33733# Royal Aircraft Establishment, Farnborough (England).
A THERMAL STRESS CALCULATION FOR ROCKET PROPELLENT CHARGES
M. R. Abbott Sep. 1971 25 p ref
(RAE-TR-71191; BR-27207) Avail: NTIS HC $3.25

A simplified mathematical model is assumed for the calculation of thermal stress arising in the charges of solid propellent rockets when cooled to their storage temperature after manufacture. The inner surface of these charges is convoluted for design reasons and this has the effect of increasing the thermal stress so that splitting of the surface can occur. The partial differential equations of the mathematical model are solved numerically. Author (ESRO)

N72-33734# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
INVESTIGATION CONCERNING THE REACTION OF UREA WITH HYDRAZINE [UNTERSUCHUNGEN UEBER DIE REAKTION VON HARNSTOFF MIT HYDRAZIN]
W. Engel 22 Nov. 1971 43 p refs In GERMAN
(ICT-6/71) Avail: NTIS HC $4.25

The reactions of urea with hydrazine and hydrazine hydrate for different molar ratios from 1:2.4 to 3:1 were investigated. For a ratio of 1:2 to 1:2.4 they result in carbohydrazide, for a ratio of 1:1 in semicarbazide, which reacts further with urea to bi-urea, and for a ratio higher than 2:1 in bi-urea. Catalytic influence on the reactions by cobalt and nickel results in bi-urea for all the molar ratios. Author (ESRO)

N72-33735# Hercules, Inc., Magna, Utah. Bacchus Works.
CASE BOND STRESS CALCULATIONS FOR FLAPPED CYLINDRICAL ANALOGS OF SOLID PROPELLANT ROCKET MOTORS: BONDLINE PARAMETRIC STUDIES Interim Report
J. McKay Anderson May 1972 92 p refs
(Contract F047611-72-C-0009)
(AD-744901; AFRPL-TR-72-55) Avail: NTIS CSCL 13/8

Numerical stress solutions were obtained for finite-length cylinders bonded to a flexible case and subjected to thermal shrinkage, axial acceleration, and internal pressure loading. Finite-element models contained insulator, flap, case-bond liner, and propellant layers typical of solid propellant rocket motors. Grid structure in the region of the flap termination was highly refined to provide accurate estimates for the maximum case-bond stresses. The stress solutions indicated that the flap length, flap modulus, and liner modulus do not significantly affect case-bond stresses. The most important parameter relative to maximum stresses is the thickness of material between the flap-insulator bondline and the liner-propellant bondline. Author (GRA)

N72-33736# Naval Postgraduate School, Monterey, Calif.
THE IDENTIFICATION OF NAVAL FUELS AND NATURAL FLUOROPHORS IN SEA WATER BY FLUORESCENCE SPECTROMETRY M.S. Thesis
Hugh W. Howard, Jr. Mar. 1972 82 p refs
(AD-743703) Avail: NTIS CSCL 21/4

Fluorescence and Excitation spectra of Navy Standard Fuel Oil (NSFO), Navy Distillate Fuel (ND), Diesel Fuel and Navy Aircraft fuels (JP-4 and JP-5) were obtained. Excitation spectra and fluorescence spectra are characteristic and may allow selective identification of these fuels. Quantitative determinations by fluorescence analysis of ND fuel oil extracted from sea water samples, with cyclohexane, showed saturation values of approximately 11 ppm. An all glass, in-situ vacuum filtering water sampler was designed and built for collection of filtered (.45 micron glass) noncontaminated sea water samples for the fluorescence analysis determination of the natural background fluorescence. Author (GRA)

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magneto-hydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N72-33737*# Princeton Univ., N.J. Guggenheim Aerospace Propulsion Labs.
SPECTROSCOPIC STUDIES OF THE EXHAUST PLUME OF A QUASI-STEADY MPD ACCELERATOR Ph.D. Thesis
Adam P. Bruckner May 1972 174 p refs
(Grant NGL-31-001-005)
(NASA-CR-128317; Rept-1041) Avail: NTIS HC $10.75 CSCL 21C

Spectroscopic and photographic investigations are reported that reveal a complex azimuthal species structure in the exhaust plume of a quasi-steady argon MPD accelerator. Over a wide range of operating conditions the injected argon remains collimated in discrete jets which are azimuthally in line with the six propellant injector orifices. The regions between these argon jets, including the central core of the exhaust flow, are occupied by impurities such as carbon, hydrogen and oxygen ablated from the Plexiglas back plate of the arc chamber. The features of this plume structure are found to be dependent on the arc current and mass flow rate. It is found that nearly half the observed velocity is attained in an acceleration region well downstream of the region of significant electromagnetic interaction. Recombination calculations show that the ionization energy is essentially frozen. Author

N72-33738*# Rocketdyne, Canoga Park, Calif.
EXPERIMENTAL INVESTIGATION OF COMBUSTOR EFFECTS ON ROCKET THRUST CHAMBER PERFORMANCE Interim Report
Jun. 1972 118 p refs
(Contract NASw-2106)
(NASA-CR-128318; R-8903) Avail: NTIS HC $8.00 CSCL 21H

A design and experimental program to develop special instrumentation systems, design engine hardware, and conduct tests using LOX/GH2 propellants in which the propellant flow stratification was controlled is described. The mixture ratio was varied from 4.6 to 6 overall. The mixture ratios in the core and outer zone were varied from 3.5 to 6 and 5 to 8, respectively. The range in boundary layer coolant was from 0 to 10 percent of the fuel. The nominal chamber pressure and thrust were 225 psia and 7000 pounds, respectively. Pressure and heat flux profiles as well as gas sampling of the exhaust products were obtained. Specific impulse efficiencies of approximately 94

percent and characteristic velocity efficiencies of approximately 97 percent were obtained during the experiments. Author

N72-33739# Cranfield Inst. of Technology (England).
A PROPOSED DOUBLE SWIRLER ATOMIZER FOR GAS TURBINE FUEL INJECTION
A. H. Lefebvre and E. R. Norster Jun. 1972 12 p refs
(Cranfield-SME-1) Avail: NTIS HC $3.00

An atomizer is proposed in which a region of high turbulence and high shear is created by the provision of an additional air swirler. The object of this swirler is to produce a swirling airstream which lies inside, and concentric with the airstream issuing from the outer swirler, but whose swirl component is in the opposite direction to that of the outer swirler. Means are provided for forming the fuel into a thin continuous sheet which is then atomized by the action of high velocity air and injected into the interface of these contra-rotating swirling air flows. An inner air swirler and, concentric with it, an airblast atomizer unit and an outer air swirler are shown. The main assembly is carried by a fuel feed arm through which fuel is conveyed to the prefilmer via six swirl ports. The inner divergent wall of the prefilmer conveys the discharged swirling fuel uniformly in a thin continuous sheet to the air atomizing lip. Previous work has shown that atomization is best when the sheet of fuel is exposed to high velocity air on both sides. In the double swirler atomizer, a small annular passage is provided between the prefilmer and the outer swirler through which air flows to strike the outer surface of the fuel sheet. Author

N72-33740*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A SINGLE AXIS ELECTROSTATIC BEAM DEFLECTION SYSTEM FOR A 5-cm DIAMETER ION THRUSTER
Walter C. Lathem Sep. 1972 18 p refs
(NASA-TM-X-68133) Avail: NTIS HC $3.00 CSCL 21C

A single-axis electrostatic beam deflection system has been tested on a 5-cm diameter mercury ion thruster at a thrust level of about 0.43 mlb (25 mA beam current at 1400 volts). The accelerator voltage was 500 volts. Beam deflection capability of plus or minus 10 deg was demonstrated. A life test of 1367 hours was run at the above conditions. Results of the test indicated that the system could possibly perform for upwards of 10,000 hours. Author

N72-33741*# Marquardt Corp., Van Nuys, Calif.
TECHNOLOGY DEVELOPMENT OF A BIOWASTE RESISTOJET, VOLUME 1
D. G. Phillips Jun. 1972 194 p refs
(Contract NAS1-9474)
(NASA-CR-112149) Avail: NTIS HC $11.75 CSCL 21H

The materials research effort conducted in support of a NASA-sponsored biowaste resistojet development program is summarized. The resistojet concept under development is the concentric tube design wherein the final pass of the gases through the thruster is through the resistance heated center tube. To produce high specific impulses, this center tube must operate at very high temperatures and it is this element that is most critical in the design. Because of the corrosive nature of the biowaste gases at high temperature, and because of the limited data available for many potential materials, the subject materials study was conducted. Author

N72-33742*# Stanford Research Inst., Menlo Park, Calif.
FAILURE ANALYSIS OF SOLID ROCKET APOGEE MOTORS Final Report
Patrick J. Martin Sep. 1972 56 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953298; SRI Proj. 1614)
(NASA-CR-128354) Avail: NTIS HC $5.00 CSCL 21H

The analysis followed five selected motors through initial design, development, test, qualification, manufacture, and final flight reports. An audit was conducted at the manufacturing plants to complement the literature search with firsthand observations of the current philosophies and practices that affect reliability of the motors. A second literature search emphasized acquisition of spacecraft and satellite data bearing on solid motor reliability. It was concluded that present practices at the plants yield highly reliable flight hardware. Reliability can be further improved by new developments of aft-end bonding and initiator/igniter nondestructive test methods, a safe/arm device, and an insulation formulation. Minimum diagnostic instrumentation is recommended for all motor flights. Surplus motors should be used in margin testing. Criteria should be established for pressure and zone curing. The motor contractor should be represented at launch. New design analyses should be made of stretched motors and spacecraft/motor pairs. Author

N72-33743*# General Electric Co., Lynn, Mass. Aircraft Engine Group.
TF-34 TURBOFAN QUIET ENGINE STUDY Final Report
D. P. Edkins, R. Hirschkron, and R. Lee 1972 98 p ref
(Contract NAS3-14338)
(NASA-CR-120914) Avail: NTIS HC $7.00 CSCL 21E

A study of high bypass turbofan engines in heavily sound-suppressed nacelles based on the TF-34 engine. The four-engine noise objective was 95 PNdb at four locations typical of takeoff and landing. Three engines were studied; these had fan pressure ratios, bypass ratios, and fan tip speeds respectively of 1.48/6.5/404 m/sec (1327 ft/sec), 1.25/13/305 (1000), 1.25/13/366(1200). The bypass 13 engines had a variable pitch fan, direct- and gear-driven. Noise suppressive treatment was identified which met 95 PNdb objective except for sideline liftoff at 6.5 bypass, full power, which was 2 PNdb noisier; at 90% power, 95 PNdb was achieved. Author

N72-33744*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
EQUATIONS OF MOTION FOR THE VARIABLE MASS FLOW-VARIABLE EXHAUST VELOCITY ROCKET
Wayne H. Tempelman Aug. 1972 13 p refs Presented at the AIAA Conf., Palo Alto, Calif., 11-12 Sep. 1972
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-128542; E-2706) Avail: NTIS HC $3.00 CSCL 21H

An equation of motion for a one dimensional rocket is derived as a function of the mass flow rate into the acceleration chamber and the velocity distribution along the chamber, thereby including the transient flow changes in the chamber. The derivation of the mass density requires the introduction of the special time coordinate. The equation of motion is derived from both classical force and momentum approaches and is shown to be consistent with the standard equation expressed in terms of flow parameters at the exit to the acceleration chamber. Author

N72-33745*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
A PORTABLE HYDRAZINE ATTITUDE PROPULSION TEST SYSTEM
Philip I. Moynihan 1 Sep. 1972 15 p refs
(Contract NAS7-100)
(NASA-CR-128342; JPL-TM-33-560) Avail: NTIS HC $3.00 CSCL 21H

The portable hydrazine attitude propulsion module is described that was designed and developed to support the attitude control pitch axis simulation tests performed on an air bearing table for the thermoelectric outer planet spacecraft program. The propulsion module was a self-contained, liquid hydrazine propulsion system from which the exhausted gases were generated within the catalyst bed of either of two nominal 0.22-N opposing thrusters. The module, which was designed for convenient assembly onto and removal from an air bearing table, was tested to establish its operational safety. This test history and the very conservative design of the module enabled it to be man-rated for operation in the presence of personnel. The report briefly summarizes the system operations during air bearing table tests, presents a detailed description of the propulsion module hardware, and discussing the system evolution. Author

N72-33746*# Boeing Co., Seattle, Wash. Commercial Airplane Group.
PARAMETRIC STUDIES OF THE ACOUSTIC BEHAVIOR OF LINED DUCTS AND DUCT-LINING MATERIALS FOR TURBOFAN ENGINE APPLICATIONS
J. Atvars [1972] 217 p refs
(Contract NAS1-10272)
(NASA-CR-111887) Avail: NTIS HC $13.00 CSCL 21E

A description is given of a flow duct test facility for simulating turbofan engine bypass duct geometry and noise environments and the data reduction techniques, along with a listing of the reduced test results. Analyses of the test data showed that the significant design parameters are the face sheet impedance, treatment length, treatment depth, honeycomb cell dimensions, duct size, number of walls lined, number of layers in the linings, air velocity, and direction of flow with reference to sound propagation. The influence of these parameters is discussed. For simple, single layer linings, a design technology was developed by means of empirical equations. Experimental results show that this technology is valid for duct sizes (or lining separations) from 4 to 12 in., lining depths of 0.25 to 1 in., and duct airflow Mach numbers from -0.4 to +0.4. It is concluded that the flow duct facility is a useful tool for investigating the basic properties of acoustically lined ducts. Author

N72-33747*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF JET CONVERGENCE ANGLE ON THE PERFORMANCE OF ANNULAR NOZZLES WITH SEMI-TOROIDAL CONCAVE PLUGS AT MACH NUMBERS UP TO 1.82
Charles E. Mercer Washington Oct. 1972 104 p refs
(NASA-TN-D-6897; L-8440) Avail: NTIS HC $3.00 CSCL 21H

Results of an investigation at static conditions and at Mach numbers up to 1.82 are presented for 12 nozzle configurations which have jet convergence angle and jet throat area as geometric parameters. The variation of jet convergence angle from 15 to 40 deg had little effect on the performance of the nozzles having the large value of primary throat area; however, increasing jet convergence angle generally had an adverse effect on performance of the nozzles having the smaller value of primary throat area. The performance of the nozzle configurations with the larger primary throat area is competitive with nozzles designed for operation over the Mach number range. Author

N72-33748*# Marquardt Corp., Van Nuys, Calif.
TECHNOLOGY DEVELOPMENT AND DEMONSTRATION OF A LOW THRUST RESISTOJET THRUSTER
G. R. Pfeifer Jul. 1972 138 p refs
(Contract NAS1-9601)
(NASA-CR-112160) Avail: NTIS HC $9.00 CSCL 21H

Three thrusters were fabricated to definitized thruster drawings using new rhenium vapor deposition technology. Two of the thrusters were operated using ammonia as propellant and one was operated using hydrogen propellant for performance determination. All demonstrated consistent operational specific impulse performance while demonstrating thermal performance better than the development units from which they evolved. Two of the thrusters were subjected to environmental structural testing including vibration, acceleration and shock loading to specifications. Both of the thrusters subjected to the environmental tests passed all required tests. The third, spare, thruster was introduced into the life test portion of the program. Two thrusters were then subjected to a life cycling test program under typical spacecraft operating power levels. During the life test sequence, the hydrogen thruster accrued 720 operating life test cycles, more than 370 on-off cycles and 365 hours of powered up time. The ammonia accrued approximately 380 on-off cycles and 392.2 on time hours of operation during the 720 cycling hour test. Both thrusters completed the scheduled operational life test in reasonably good condition, structurally integral and capable of indefinite further operation. Author

N72-33749*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DURABILITY TESTS OF A FIVE CENTIMETER DIAMETER ION THRUSTER SYSTEM
Shigeo Nakanishi 1972 17 p refs Proposed for presentation at 8th Propulsion Joint Specialists Conf., New Orleans, 29 Nov. - 1 Dec. 1972; sponsored by AIAA and Soc. of Automotive Engr.
(NASA-TM-X-68132; E-7128) Avail: NTIS HC $3.00 CSCL 21C

A modified Hughes SIT-5 system is being tested for durability at the Lewis Research Center. As of October 1, 1972, the thruster subsystem has logged over 8000 hours of operation. The initial 2023 hours were run with a translating screen thrust vector grid. The thruster is currently operating with an electrostatic type vector grid. Profiles and maps taken at widely separated intervals show that performance and operating characteristics have remained essentially constant. Overall efficiency is about 32 percent and power to thrust ratio is 170 watts per millipound at a specific impulse of 2500 seconds. Telescopic examination of the vector grid shows some sputtering erosion due to charge exchange and direct impingement ions. Author

N72-33750# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Luftsaugende Antriebe.
COMPARISON OF TURBOJET, TURBOROCKET AND RAMJET AS A PROPULSION SYSTEM FOR LONG RANGE AIRPLANES AT MACH NUMBERS BETWEEN 2 AND 4 [VERGLEICH VON TURBOTRIEBWERK, TURBORAKETE UND STAUSTRAHLTRIEBWERK ALS ANTRIEB FUER FLUGZEUGE GROSSER REICHWEITE BEI MACHZAHLEN ZWISCHEN 2 UND 4]
Egbert Riester Jun. 1972 38 p refs In GERMAN; ENGLISH summary
(DLR-FB-72-38) Avail: NTIS HC $4.00; DFVLR, Porz: 10,50 DM

Turbojet, turborocket, and ramjet engines are compared for long distance cruising flight in the Mach number range from 2 to 4. The additional drag of engines with air flow rates of the same cross section area at the undisturbed flow in front of the engine, was compared. It is shown that even with modern component technology the turbojet is the optimum propulsion system up to Mach 3.5. Above this Mach number the ramjet becomes more effective. The turborocket is advantageous at high Mach numbers because of its high thrust density, although its specific impulse is somewhat lower. Author (ESRO)

N72-33751# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LIQUID ROCKET ENGINES. PRINCIPLES OF THE THEORY OF THE UNITS OF LIQUID ROCKET ENGINES AND POWER PLANTS
E. B. Volkov, L. G. Golovkov, and T. A. Syritsyn 25 Feb. 1972 660 p refs Transl. into ENGLISH of the publ. "Zhidkostnyye Raketnyye Dvigatelli. Osnoy Teorii Agregatov ZhRD i Dvigatelnykh Ustanovok", Moscow, Min. Oborony SSSR, 1970 590 p
(AD-743645; FTD-MT-24-1122-71) Avail: NTIS CSCL 21/8

In the book the principles of the theory and calculation of units of liquid rocket engines (combustion chambers, pumps, turbines, gas generators) are presented. We give the static and dynamic characteristics of the engine. In addition to principles of the theory of individual units we examine the operation of the engine as a whole, i.e., the operation of the engine as an assembly of interconnected units. The basic aim of the book is to acquaint the reader with the theory of the units of modern liquid rocket engines. Author (GRA)

N72-33752# Naval Postgraduate School, Monterey, Calif.
INLET DISTORTION, VORTICITY, AND STALL IN AN AXIAL-FLOW COMPRESSOR M.S. Thesis
Clinton Jefferson Farmer Mar. 1972 124 p refs
(AD-743725) Avail: NTIS CSCL 21/5

A new approach to defining inlet distortion factors for

axial-flow compressors is presented. A summary of past analyses of inlet distortion, along with a brief review of flow-distortion definition and compressor performance, provides a background for the proposed theory. Inlet flow-distortion in terms of total-pressure fluctuations at the compressor face is converted to vorticity. The effects of vorticity on the internal aerodynamics of the compressor are investigated with some approximate calculations included to indicate the validity of this approach. Refinements and alternate solutions to the theory which could lead to definition of a more comprehensive and reliable definition of stall-inducing inlet distortion are included.
Author (GRA)

N72-33753# Bendix Corp., Teterboro, N.J. Navigation and Control Div.
AUTOMATIC THROTTLE CONTROL FOR TRANSPORT AIRCRAFT WITH MAXIMUM QUADRANT POSITION LIMITED BY ENGINE PRESSURE RATIO Final Technical Report
Stephen Skaritka Jan. 1972 27 p
(Contract F33615-69-C-1468; AF Proj. 8226)
(AD-743314; Rept-7211-361; AFFDL-TR-71-112) Avail: NTIS CSCL 21/5

The report describes an automatic throttle control system that limits maximum throttle lever position as a function of engine pressure ratio. Limit EPR is sensed by an outside air temperature gauge calibrated in EPR as based on thrust level limits contained in the aircraft operator's manual. Limit control of EPR is accomplished by stopping the throttle lever when the observed EPR equals the temperature sensed limit value. The EPR limit control was designed primarily to permit use of maximum permissible thrust during takeoff and go-around maneuvers with an automatic throttle system utilizing a single servo.
Author (GRA)

N72-33754# Bell Aerospace Co., Buffalo, N.Y.
A PRELIMINARY DESIGN ANALYSIS OF A MULTI-CHANNEL EJECTOR THRUST AUGMENTATION CONCEPT WITH OVAL OR RECTANGULAR AIR SUPPLY DUCTS Final Report, Aug. - Dec. 1971
Donald C. Wright, J. G. Allen, W. N. Meholick, F. R. Salter, and R. Ashby May 1972 75 p refs
(Contract F33615-71-C-1802; AF Proj. 7116)
(AD-744839; Rept-2445-953001; ARL-72-0062) Avail: NTIS CSCL 21/5

The report represents the results of a minimum preliminary design and analysis to determine the feasibility of achieving improved mixing efficiency with area ratios (A2 to A0) near 27 for the multichannel ejector thrust augmentation concept. This is to be accomplished by replacing the existing cylindrical air supply ducts presently being used on an existing four channel ejector wing model in Building 71B, G Bay, at WPAFB, Dayton, Ohio, with oval or rectangular ducts incorporating an improved ejector nozzle design. This design study has been based on the use of the present Lycoming PLF1A-2 engine and includes investigations into the feasibility of eliminating the bleed air from the plenum and its effects in regard to engine performance.
Author (GRA)

N72-33755# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
GAS DYNAMICS OF DIFFUSERS AND EXHAUST DUCTS OF TURBOMACHINES
M. E. Deich and A. Ye. Zaryankin 28 Apr. 1972 482 p refs Transl. into ENGLISH of the publ. "Gazodinamika Diffuzorov i Vykhlopnykh Patrubkov Turbomashin" Moscow, Energiya, 1970 p 1-384
(AD-745470; FTD-MT-24-1450-71) Avail: NTIS CSCL 21/5

Certain problems of the gas dynamics of diffusers and exhaust ducts for single positions of the boundary layer theory are given in the book. Methods of calculation, generalized experimental data and recommendations as to the choice of various parameters of diffusers are given. New effective designs of exhaust ducts, such as branck connections with cross-cut and elliptical diffusers are described. The book is intended for workers of design offices and research laboratories of turbine factories and also for students and post-graduate students.
Author (GRA)

N72-33756# AiResearch Mfg. Co., Phoenix, Ariz.
ADVANCED, SMALL, HIGH-TEMPERATURE-RISE COMBUSTOR PROGRAM Semiannual Progress Report, 1 Oct. 1971 - 31 Mar. 1972
S. C. Hunter 15 Apr. 1972 69 p refs
(Contract DAAJ02-70-C-0060)
(AD-745400; PE-8120-R21) Avail: NTIS CSCL 21/5

The report describes continuing effort made toward the development of a combustor and combustor elements for application in an advanced gas turbine.
GRA

N72-33757# Naval Weapons Center, China Lake, Calif.
LONGITUDINAL MODE ACOUSTIC LOSSES IN SHORT NOZZLES, REVISION 1
Ben T. Zinn Jun. 1972 26 p refs
(AD-744623; NWC-TP-5206-Rev-1) Avail: NTIS CSCL 21/8

The report is a revision of a previous report AD-728 754 that investigated longitudinal mode acoustic losses in short nozzles. In the present report the analysis of nozzle acoustic losses has been extended to rigorously account for second order effects. It is shown herein that when the time average of the mass flux in the wave is zero, the nozzle acoustic losses can be expressed in terms of first order quantities only. It is also shown that the term describing the nozzle acoustic losses is the flux term in an equation that describes the instantaneous conservation of wave energy in the presence of mean flow. The revised report establishes the relationship between nozzle acoustic losses and the expressions used to calculate the nozzle decay coefficient.
Author (GRA)

N72-33758# Michigan Univ., Ann Arbor. Cavitation and Multiphase Flow Lab.
LIQUID DROPLET IMPINGEMENT STUDIES AT THE UNIVERSITY OF MICHIGAN
F. G. Hammitt and Y. C. Huang May 1972 18 p refs To be presented at Heat and Fluid Flow in Steam and Gas Turbine Plant Symp., Coventry, England, Apr. 1973
(Grant NSF GK-730)
(PB-210627; UMICH-03371-16-T) Avail: NTIS HC $3.00 CSCL 21E

Work relating to the turbine droplet impingement program is described. While this includes the development of a low pressure wetstream tunnel for studies of droplet formation and also experiments upon material resistance and droplet impingement, it primarily concerns numerical studies of droplet impingmemt upon target surfaces. Results include pressure and volocities within the drop and upon target surfaces. Pressures are compared with a slab collision model and with simple water hammer, not involving correction for actual shock wave velocity in the compressed liquid.
Author (GRA)

N72-33759# Bureau of Mines, Washington, D.C.
A FIELD SURVEY OF EMISSIONS FROM AIRCRAFT TURBINE ENGINES
F. W. Cox, F. W. Penn, and J. O. Chase May 1972 32 p refs
(PB-210220; BM-RI-7634) Avail: NTIS HC $3.75 CSCL 13B

Exhaust emissions were measured from 25 aircraft turbine engines using Jet A fuel. Analytical apparatus, procedures, and results are described. Carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, and aldehydes were measured at engine operating modes representing power levels used in airline operation. Engines retrofitted with smoke-reducing burner cans produced less carbon monoxide, hydrocarbon, and aldehyde emissions, and slightly more oxides of nitrogen than engines with standard burner cans.
Author (GRA)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation, and Van Allen radiation belts. For related information see also: 13 Geophysics; and 24 Physics, Atomic, Molecular, and Nuclear.

N72-33760 Chalmers Univ. of Technology, Goteborg (Sweden).
SEARCHES FOR MICROWAVE SPECTRAL LINE RADIATION FROM SOME MOLECULES IN THE INTERSTELLAR MEDIUM
T. Cato, J. Ellder, B. Hoeglund, O. E. H. Rydbeck, B. Roennaeg, and A. Sume 1972 26 p refs
(RR-109) Copyright. Avail: Issuing Activity

The Onsala 25.6 m radio telescope equipped with travelling wave maser radiometers at the appropriate frequencies was used in searches for absorption or emission lines from a number of different organic and inorganic modecules in the direction of several radio sources. The molecules include OH, SO2, HCN, CH, H2CS, NH2CHO, and CH3CHO. All searches gave negative results, with possible exception for H2CS. Details of the observations are tabulated. Author

N72-33761 Engineering Sciences Data Unit, London (England).
SOLAR HEATING: TOTAL DIRECT IRRADIANCE WITHIN THE EARTH'S ATMOSPHERE
Jun. 1969 16 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-69015) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The spectrum of solar irradiance outside the earth's atmosphere is considered. Atmospheric attenuation of certain wavebands of the spectral irradiance is discussed. In estimating the effect of atmospheric attenuation, simplifying assumptions were made with the objective of obtaining an overestimate rather than an underestimate of solar irradiance. K.P.D.

N72-33762 International Geophysical Year World Data Center A, Boulder, Colo.
CATALOGUE OF DATA ON SOLAR TERRESTRIAL PHYSICS IN WORLD DATA CENTER A SUBCENTERS
Sep. 1972 278 p Supersedes UAG-15
(UAG-20; UAG-15) Avail: National Climatic Center, Federal Building, Asheville, N. C. 28801. Attn: Publications. HC $1.50

All the data associated with the various disciplines of solar-terrestrial physics received by the World Data Center are listed in this catalogue. Considered are solar and interplanetary phenomena, ionospheric phenomena, flare-associated events, geomagnetic phenomena, aurora cosmic rays, and airglow. G.G.

N72-33763*# California Univ., Los Angeles. Ubst. of Planetary Physics.
CHARGED PARTICLE AND MAGNETIC FIELD RESEARCH IN SPACE Progress Report, 1 Jul. 1971 - 30 Jun. 1972
13 Jul. 1972 49 p refs
(Contract NGL-05-007-004)
(NASA-CR-128348) Avail: NTIS HC $4.50 CSCL 03B

Research completed and in progress is described, related publications and reports are listed, and abstracts of papers and talks on results of the research are given. The charged particle research centered on OGO-5 and OGO-6 electron spectrometer data, and theoretical radiation belt studies. Work on the ATS-1 magnetometer project included development of production data reduction programs, development of spectral analysis produres, and scientific studies of ULF waves at synchronous orbit. The magnetic fields research also included work on the Mariner project and theoretical studies on the solar wind. N.E.N.

N72-33764*# California Univ., Berkeley. Space Sciences Lab.
PLANETARY X RAY EXPERIMENT: SUPPORTING RESEARCH FOR OUTER PLANETS MISSION: EXPERIMENT DEFINITION PHASE Final Report
Kevin Hurley and Kinsey A. Anderson 28 Aug. 1972 73 p refs
(Grant NGR-05-003-458)
(NASA-CR-128316; SSL-Ser-13-Issue-78) Avail: NTIS HC $5.75 CSCL 03B

Models of Jupiter's magnetosphere were examined to predict the X-ray flux that would be emitted in auroral or radiation zone processes. Various types of X-ray detection were investigated for energy resolution, efficiency, reliability, and background. From the model fluxes it was determined under what models Jovian X-rays could be detected. Author

N72-33765*# TRW Systems Group, Redondo Beach, Calif. Space Sciences Dept.
THE OPGT/MJS PLASMA WAVE SCIENCE TEAM Final Report, Feb. - 31 Aug. 1972
F. L. Scarf 1 Sep. 1972 73 p refs
(Contract NASw-2228)
(NASA-CR-128315; TRW-18864-6004-R0-00) Avail: NTIS HC $5.75 CSCL 03B

Some properties of a model magnetosphere for Saturn were studied in order to determine the bounds that can be set on surface field strength and trapped particle population. The primary observational constraint was that nonthermal radiation similar to the Jovian radio emissions must be undetectable from Earth. It is argued that for a Saturn surface field of approximately one gauss, particles that are energized as they diffuse in from the magnetopause with conservation of magnetic moment will produce synchrotron radiation levels that are undetectable at a range of 9.5 AU. The plasma instabilities that heat the oncoming wind particles at the bow shock and others that can limit the stably-trapped flux levels are also discussed. Author

N72-33766*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
HIGH ENERGY X-RAY SOURCES NEAR THE GALACTIC EQUATOR BETWEEN I(II) APPROXIMATELY 335 DEG AND APPROXIMATELY 350 DEG
Jeffrey E. McClintock, George R. Ricker, Stanley G. Pyckman, and Walter H. G. Lewin Feb. 1972 8 p refs Sponsored in part by NSF and AEC
(Contract NAS5-3205)
(NASA-CR-130061; CSR-P-72-77) Avail: NTIS HC $3.00 CSCL 03B

On 15-16 October 1970, balloon x-ray observations were carried out from Mildura, Australia. At least two hard x-ray sources, energies > 18 keV, were detected near the Galactic equator. Author

N72-33767# Lockheed Missiles and Space Co., Palo Alto, Calif.
INVESTIGATION OF THE ANGULAR DISTRIBUTION OF PARTICLES FROM RESULTS ON THE COSMOS-219
L. V. Zubareva, O. I. Savun, P. I. Shavrin, and V. S. Tsaplin 1972 2 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 3: Fiz.-Astron. (Moscow), no. 3, 1972 p 366-367
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The number of trapped particles was measured by the Cosmos 219 scintillation counter and soft proton spectrometer, and their angle of the distribution was determined simultaneously by a magnetometer. The data obtained and the processing method are briefly described, and sources and degree of error are considered. The pitch angle distributions are given in graphs and are described by a sine function. N.E.N.

N72-33768*# Texas Univ., Dallas.
MEASUREMENT OF THE DEGREE OF ANISOTROPY OF THE COSMIC RADIATION USING THE IMP SPACE

VEHICLE Final Technical Report
R. A. R. Palmeira and F. R. Allum Oct. 1972 31 p refs
(Contract NAS5-9075)
(NASA-CR-130090) Avail: NTIS HC $3.75 CSCL 03B

The detector and data reduction techniques used in connection with the cosmic ray experiments designed for and flown on Explorer 34 and 41 satellites are described. A history of the program development and the present status of data processing are briefly summarized. The instrument to measure the anisotropy and energy spectra of cosmic ray electrons and protons, and X-rays of solar and galactic origin is discussed. The main characteristics of the detectors and the stability during 23 months of operation are described. The method of analysis of the angular distribution of solar cosmic ray particles in the ecliptic plane is given. It is shown that the anisotropy of low energy particles of solar origin decreases sharply to a very small value when the satellite penetrates the magnetosphere. Author

N72-33769# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
GEOMAGNETIC TAIL OSCILLATIONS IN QUASIHYDRODYNAMICS
A. I. Ershkovich and S. A. Martjanov 1972 26 p refs
(PR-105) Avail: NTIS HC $3.50

The effect of pressure anisotropy on the geomagnetic tail oscillations is studied on the base of Chew-Goldberger-Low equations. It is shown that the anisotropy of solar wind plasma pressure may result in generation of the waves if there were no waves in the case of isotropy. The anisotropy of plasma pressure in the magnetospheric tail may also cause an essential distortion of oscillation spectra. Author (ESTO)

N72-33770# Academy of Sciences (USSR), Moscow. Inst. for Space Research.
NONLINEAR WAVES IN TYPE-1 COMET TAILS
A. I. Ershkovich and A. A. Chernikov 1972 19 p refs
(PR-108) Avail: NTIS HC $3.00

Nonlinear stabilization of Kelvin-Helmholtz instability occuring when disturbance amplitudes become finite is studied. A comet tail is considered as a plasma cylinder with free boundary immersed in the solar wind plasma. Due to Kelvin-Helmholtz instability of Kink modes the type-1 comet tail is shown to take stable shape. However the sausage-like modes with wavelength of cylinder circumference cannot be stabilized due to finite amplitudes. The Kelvin-Helmholtz instability of sausage modes lends to the comet tail (or individual ray) losing its regular structure and breaking into individual clouds with the characteristic scale of the order of cylinder diameter.
Author (ESRO)

N72-33771# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
TRAPPED RADIATION STUDIES INVOLVING PLASMA INSTABILTIES AND RADIAL DIFFUSION Annual Report, Jan. 1971 - Feb. 1972
John B. Cladis, Gerald T. Davidson, William E. Francis, Walter I. Futterman, and Lester L. Newkirk Apr. 1972 52 p refs
(Contract DASA01-71-C-0047)
(AD-743549; LMSC-D246353) Avail: NTIS CSCL 04/1

The generation of unstable waves in the magnetosphere is reviewed, with emphasis on waves occurring near the trapped particles' gyrofrequencies. Relativistic modifications to the basic theory are described. The evolution of trapped particles' distribution (diffusion) is discussed, and the nonlinear theories of wave propagation and growth are invoked as the means whereby the evolution of the distribution functions can be studied. It is pointed out that, because of difficulties in the analytic theories, computer simulation may be the most certain technique for investigating effects of unstable waves on particles. Some particular unsolved problems are indicated, with special emphasis on trapping of artificially injected electrons. The development of a computer program which simulates actual physical processes in the magnetosphere is described. Author (GRA)

N72-33772# Denver Univ., Colo. Dept. of Physics.
INFRARED SOLAR SPECTRUM OBSERVED FROM A BALLOON BORNE SPECTROMETER BETWEEN 9300 AND 11000 A AND BETWEEN 12000 AND 19000 A Interim Report
Aharon Goldman, David Murcray, Frank Murcray, and Walter Williams 15 Jan. 1972 71 p refs
(Contract F19628-68-C-0233; ARPA Order 363; AF Proj. 8662)
(AD-744851; AFCRL-72-0349; SR-8) Avail: NTIS CSCL 03/2

Records are presented of the infrared solar spectrum in the 0.9 - 1.1 micrometers regions, observed from altitudes up to 30 km, with a resolution of 0.5 A. The spectra show many new solar absorption lines which appear only at high altitude records, where the telluric absorptions are eliminated. Author (GRA)

N72-33773# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Space Physics Lab.
A BALLOON EXPOSURE OF 30 SQUARE METERS OF CORPUSCULAR PHOTOGRAPHIC MATERIALS IN SEARCH OF SUPER-HEAVY COSMIC RADIATION
Robert C. Filz, Wolfgang Enge (Inst. fuer Reine und Angew. Kernphys., Kiel, West Germany), and Albert Davis (Franklin Pierce Coll., Rindge, N. H.) 6 Apr. 1972 18 p refs
(AF Proj. 8600)
(AD-743925; AFCRL-PSRP-487; AFCRL-72-022916) Avail: NTIS CSCL 04/1

Thirty square meters of plastic and nuclear emulsions along with some Cerenkov sensitive material were exposed to cosmic radiation at 120,000 feet in May 1971. The balloon was launched from Holloman AFB, New Mexico (vertical cutoff rigidity pc = 5.0 BV) and remained in the immediate vicinity for 48 hours. During this period, four distinct altitude intervals were distinguished by a sliding plate. Preliminary examination of 1/3 of the cellulose nitrate layer indicates about 170 nuclei of charge greater than iron will be available for study. Precision measurements will be performed on layers of Daicel cellulose nitrate, Bayer cellulose triacetate and Lexan to determine the charge spectrum of relativistic very heavy cosmic rays. Measurements on the Cerenkov film sensitive to relativistic nuclei with charge greater than 60 and velocity greater than about 0.7 will provide a good check on the velocity and charge of super heavy nuclei. Preliminary scanning data is discussed.
Author (GRA)

N72-33774# Aerospace Corp., El Segundo, Calif. Lab. Operations.
ELECTRON TEMPERATURE ASYMMETRY AND THE STRUCTURE OF THE SOLAR WIND Technical Report, Sep. 1969 - Jun. 1971
Michael Schulz and Aharan Eviator 30 May 1972 52 p refs
Prepared in cooperation with Tel-Aviv Univ., Israel
(Contract F04701-71-C-0172)
(AD-745576; TR-0172(2260-20)-18; SAMSO-TR-72-162) Avail: NTIS CSCL 03/2

The observational fact that, in the frame of the solar wind, outgoing thermal electrons have a somewhat larger mean energy than those incoming corresponds to an outward heat flow that can be simulated in the extreme by a purley exospheric model. In the present work, microinstabilities of the interplanetary plasma are studied within the framework of an underlying electron-proton solar exosphere. Although collisions are neglected by definition, heat-flow moments of the distribution functions are significantly bounded by virture of geometry. This fact permits velocity-space instabilities driven by heat flow to be analyzed under the most extreme conditions (exospheric) conceivably attainable. Author (GRA)

N72-33790* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NONEFFECT OF SOLAR ECLIPSES ON THE ATMOSPHERE
John S. Theon *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 47-51 (For availability see N72-33780 24-30)
CSCL 03B

N72-33797* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR WIND MAINTENANCE OF THE NIGHTTIME VENUS IONOSPHERE
Richard E. Hartle *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 79-82 ref (For availability see N72-33780 24-30)
CSCL 03B

N72-33803* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESULTS FROM THE GSFC OSO 7 SPECTROHELIOGRAPH
Werner M. Neupert *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 111-116 (For availability see N72-33780 24-30)
CSCL 03B

N72-33804* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSPORT OF COSMIC RAYS IN THE SOLAR CORONA
Kenneth H. Schatten *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 117-121 refs (For availability see N72-33780 24-30)
CSCL 03B

N72-33805* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR PARTICLE COMPOSITION MEASUREMENTS
Donald V. Reames *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 122-125 ref (For availability see N72-33780 24-30)
CSCL 03B

N72-33806* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CHARGE SPECTRA OF SOLAR COSMIC RAYS
Tycho T. VonRosenvinge *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 126-130 ref (For availability see N72-33780 24-30)
CSCL 03B

N72-33807* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TYPE 3 SOLAR RADIO BURSTS
Larry G. Evans *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 131-134 refs (For availability see N72-33780 24-30)
CSCL 03B

N72-33808*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUIETTIME ELECTRON INCREASES
Lennard A. Fisk *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 135-138 ref (For availability see N72-33780 24-30)
CSCL 03B

N72-33809*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY CHARGE AND ENERGY SPECTRA ABOVE 10 GeV
Jonathan F. Ormes *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 139-145 refs (For availability see N72-33780 24-30)
CSCL 03B

N72-33810* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SURVIVAL OF HEAVY NUCLEI IN COSMIC RAY SOURCE ENVIRONMENTS
V. K. Balasubrahmanyan *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 146-150 (For availability see N72-33780 24-30)
CSCL 03B

N72-33814* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSE X-RAYS FROM THE GALACTIC DISK
Peter J. Serlemitsos *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 165-169 (For availability see N72-33780 24-30)
CSCL 03B

N72-33815* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STELLAR X-RAY TEMPORAL VARIATIONS
Stephen S. Holt *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 170-174 (For availability see N72-33780 24-30)
CSCL 03B

N72-33816* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERSTELLAR MEDIUM MODEL
James C. Novaco *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 175-179 refs (For availability see N72-33780 24-30)
CSCL 03B

N72-33819* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW INTENSITY H-BETA EMISSION FROM THE INTERSTELLAR MEDIUM
Ronald J. Reynolds *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 190-192 (For availability see N72-33780 24-30)
CSCL 03B

N72-33824* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE APOLLO 15 X-RAY FLUORESCENCE EXPERIMENT
Isidore Adler *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 208-213 (For availability see N72-33780 24-30)
CSCL 03B

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N72-33775*# Stanford Univ., Calif. Inst. for Plasma Research.
A SIMPLE ANALYTIC APPROXIMATION FOR DUSTY STROEMGREN SPHERES
Vahe Petrosian, Joseph Silk (Calif. Univ., Berkeley), and George B. Field (Calif. Univ., Berkeley) Jun. 1972 12 p refs
(Grants NGR-05-020-510; NGR-05-003-453; NSF GP-18476)
(NASA-CR-128319; SU-IPR-459) Avail: NTIS HC $3.00 CSCL 20I

An analytic approximation is illustrated to Stromgren's solution for H II regions which permits explicit exhibition of the effects of internal dust on the ionization structure. Far infrared observations of H II regions are accounted for in terms of true absorption by internal dust of a significant fraction of the Lyman continuum photons. Author

N72-33776*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
POSSIBILITY OF SATURNIAN SYNCHROTRON RADIATION
Joe L. Luthey Jun. 1972 35 p refs
(Grant NGL-16-001-002)
(NASA-CR-128334; U-of-Iowa-72:18) Avail: NTIS HC $3.75 CSCL 03B

Synchrotron spectra were computed for a hypothetical Saturn radiation belt. A monoenergetic distribution of relativistic electrons was assumed to exist in a toroidal volume in a dipole magnetic field aligned with the rotation axis. When synchrotron emission is added to the thermal component implied by observations at wavelengths shorter than 50 cm, the upturn in the total emission spectrum may be gradual to sharp, depending on the critical wavelength and the number density of radiating electrons. With the constraint of the pressure balance equation, the ranges of magnetic field intensity, and electron energy, and density were tabulated and nomographically illustrated. For several estimates of the magnetic field loading factor, the minimum surface magnetic field intensity and minimum electron number density were computed. Author

N72-33777*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 16 MISSION REPORT
Aug. 1972 372 p refs
(NASA-TM-X-68635; MSC-07230) Avail: NTIS HC $20.75 CSCL 22C

Information is provided on the operational and engineering aspects of the Apollo 16 mission. Customary units of measurement are used in those sections of the report pertaining to spacecraft systems and trajectories. The International System of Units is used in sections pertaining to science activities. Author

N72-33778*# Texas Univ., Austin. Applied Mechanics Research Lab.
CALCULATION OF TRAJECTORIES USING CONSTANT AND SLOWLY VARYING FUNCTIONS
Bobby K. Culpepper Dec. 1971 69 p refs
(Grant NGL-44-012-008)
(NASA-CR-128369; AMRL-1045) Avail: NTIS HC $5.50 CSCL 22C

A method is presented for calculating trajectories for the restricted problem of three bodies which utilizes conic propagation of the state vector with frequency correction of position and velocity by means of a constant or slowly varying function. This method of calculating trajectories was applied to the planar circular restricted three body problem, the planar elliptic restricted problem, and the ephemeral restricted problem. Two methods (the refined method and the straight forward method) of determining the direction of the position correction are presented for the circular restricted problem and the elliptic restricted problem of three bodies. Only the straight forward method was used with the ephemeral restricted problem. The earth, the moon, and a space vehicle comprise the restricted three body model that is used. Author

N72-33779*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ON THE MOON WITH APOLLO 15: A GUIDEBOOK TO HADLEY RILLE AND THE APENNINE MOUNTAINS
Gene Simmons Jun. 1971 51 p refs
(NASA-TM-X-68638) Avail: NTIS; SOD $0.50 CSCL 03B

Information is given in simple terms of the Apollo 15 lunar exploration and scientific equipment, to be used in conjunction with other material shown over commercial TV. The EVAs of the astronauts on the surface are divided into experiments and traverses. The landing site and experimental equipment are described, and life sketches are given of the crew. N.E.N.

N72-33780*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIGNIFICANT ACCOMPLISHMENTS IN SCIENCES, 1971
Jun. 1972 220 p refs Symp. held at Greenbelt, Md., 10 Nov. 1971
(NASA-TM-X-66034; X-601-72-218) Avail: NTIS HC $13.00 CSCL 14B

The proceedings of a conference on aerospace sciences conducted at the Goddard Space Flight Center on 10 November, 1971 are presented. The subjects discussed include: (1) soil moisture measurements with microwave radiometers, (2) Arctic ice measurements with microwave radiometers, (3) measurements of ocean color, (4) studies with satellite radiometer data, (5) the global hydrogen budget, (6) solar radio bursts, (7) transport of cosmic rays in the solar corona, and (8) interplanetary dust and comet orbits. For individual titles, see N72-33781 through N72-33824.

N72-33781* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE MEASUREMENTS WITH MICROWAVE, RADIOMETERS **c13**
Thomas J. Schmugge *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 3-6 (For availability see N72-33780 24-30)
CSCL 08M

One technique of measuring moisture content that appears promising is that of microwave radiometry. In the microwave region of the spectrum, the emissivity of water is approximately 0.4, whereas that of dry soil is approximately 0.9. Therefore, the emissivity of the soil can range from about 0.6 to 0.9 as the soil changes from a wet to a dry condition. Recent ground base measurements have demonstrated emissivity changes of this magnitude. To test the use of this approach for remote sensing of soil moisture, flights were made over agricultural test sites in the vicinity of Phoenix, Ariz., during late February 1971. On the same day, soil moisture measurements were made on the ground for 200 fields. On board the aircraft were six microwave radiometers, ranging in wavelength from 21 cm to 8 mm. The results of one of these radiometers are presented. Author

N72-33782* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MINERAL EXPLORATION FROM HIGH ALTITUDE IMAGERY **c13**
Herbert W. Blodget *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 7-12 ref (For availability see N72-33780 24-30)
CSCL 08G

Types of remote sensing which can best be done from spacecraft and types which can best be done from aircraft are discussed. Five geologically distinctive areas in northwestern Saudi Arabia were selected for detailed study. The areas were mapped as thoroughly as possible on each of several different types of imagery. The final objective was to identify those classes of geologic problems that can best be resolved using satellite data and then to identify areas where orbital imagery might profitably be used to extend existing knowledge, with emphasis placed on mineral exploration. Author

N72-33783* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARCTIC ICE MEASUREMENTS WITH MICROWAVE RADIOMETERS **c13**
Per Gloersen *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 13-18 (For availability see N72-33780 24-30)
CSCL 08L

The application of microwave radiometers for measuring Arctic ice is discussed. The acquisition of Arctic ice data simultaneously on the surface with conventional instruments and remotely with microwave and infrared radiometers, photography, and a laser geodolite is described. A multifrequency view of a large multilayer ice floe is presented. The significance of the data recordings is explained. Author

N72-33784* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MULTISPECTRAL METHOD OF DETERMINING SEA SURFACE TEMPERATURES **c13**
William E. Shenk *In its* Significant Accomplishemnts in Sci., 1971 Jun 1972 p 19-23 (For availability see N72-33780 24-30)
CSCL 08J

A multispectral method for determining sea surface temperatures is discussed. The specifications of the equipment and the atmospheric conditions required for successful multispectral data acquisition are described. Examples of data obtained in the North Atlantic Ocean are presented. The differences between the actual sea surface temperatures and the equivalent blackbody temperatures as determined by a radiometer are plotted. P.N.F.

N72-33785* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENTS OF OCEAN COLOR **c13**
Warren A. Hovis *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 24-29 (For availability see N72-33780 24-30)
CSCL 08J

An airborne instrument for determining ocean color and measurements made with the instrument are discussed. It was concluded that a clear relationship exists between the chlorophyll concentration and the color of the water. High altitude measurements from 50,000 feet are described and the effects of atmospheric scattering on the energy reaching the sensor are examined. The measured spectrum of ocean color at high and low altitudes is plotted. P.N.F.

N72-33786* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC WIND FIELDS DERIVED FROM NIMBUS OZONE MEASUREMENTS **c20**
Cuddapah Prabhakara *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 30-33 (For availability see N72-33780 24-30)
CSCL 04A

The global ozone measurements made by the Nimbus 3 IRIS were used to trace the circulation in the upper troposphere. This was possible because the atmospheric ozone content is closely related to the geopotential heights in the upper troposphere. There is a linear relationship between 200 mbar geopotential heights and the total ozone measured by Nimbus 3. With the help of the geostrophic law, atmospheric winds can be derived from the horizontal gradient of the geopotential heights. Utilizing the linear relationship shown, winds can be deduced from satellite measurements of total ozone. Author

N72-33787* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATOSPHERIC OZONE **c13**
Richard W. Stewart *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 34-36 ref (For availability see N72-33780 24-30)
CSCL 04A

The photochemical and transport processes in the earth stratosphere are discussed. The effects of certain trace constituents such as water vapor and oxides of nitrogen on the stratospheric ozone distribution are analyzed. The changes in the surface ultraviolet radiation levels which result from changes in the chemical composition in the stratosphere are examined. The influences of absorption and scattering of ultraviolet radiation on the thermal structure of the stratosphere are explained. Author

N72-33788* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VERTICAL MOTIONS INFERRED FROM SATELLITE RADIOMETRY **c13**
Vincent V. Salomonson *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 37-41 (For availability see N72-33780 24-30)
CSCL 04A

Medium resolution radiometer measurements on Nimbus 2 and 3 and relatively high resolution measurements on Nimbus 4 have been made in 6.4 to 6.9 and 20 to 23 microns water vapor absorption regions where the weighed means in the observed radiation occur in the troposphere near the 400 and 600 mbar levels, respectively. An example of the imagery obtained from the Nimbus 4 temperature-humidity infrared radiometer (THIR) is shown. This example demonstrates clearly that there is a distinct pattern difference between the 6.7 microns observations coming from the midtroposphere and the more common 11.5 microns atmospheric window observations showing the emitted radiation associated with opaque surfaces such as the ground or optically thick clouds. Author

N72-33789* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STUDIES WITH SATELLITE RADIOMETER DATA **c14**
Milton Halem *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 42-46 (For availability see N72-33780 24-30)
CSCL 14B

The application of satellite radiometer data for analyzing and predicting global winds is discussed. The data obtained from the vertical temperature profile radiometer of the ITOS D satellite are described. The development of a nine level model for analyzing the physical properties of radiative transfer and cloud effects in the atmosphere is presented. Comparisons are made between various methods of applying the satellite radiometer data. P.N.F.

N72-33790* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NONEFFECT OF SOLAR ECLIPSES ON THE ATMOSPHERE **c29**
John S. Theon *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 47-51 (For availability see N72-33780 24-30)
CSCL 03B

The effects of the removal of solar radiation, through solar eclipse, on the structure of the thermosphere are examined. The March 7, 1970 eclipse was explored with pilot probe rockets at times during the 42 minute period corresponding to 40, 80, and 100 percent totality. Measuring results show small temperature disturbances especially below 90 km. At levels above 100 km, temperature changes were very large. Results also show that temperature profiles have a warming trend at the start of the eclipse followed by a continuous cooling as the eclipse progresses. E.H.W.

N72-33791* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GLOBAL HYDROGEN BUDGET **c13**
Henry C. Brinton *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 52-57 refs (For availability see N72-33780 24-30)
CSCL 04A

Experimental results, based on Explorer 32 data, on the density, temporal variation, and distribution of atomic hydrogen in the atmosphere are reported. E.H.W.

N72-33792* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC CONTROL OF THE HIGH LATITUDE THERMOSPHERE **c13**
Alan E. Hedin *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 58-61 (For availability see N72-33780 24-30)
CSCL 04A

Observations made by the neutral mass spectrometer on board the polar orbiting OGO-6 satellite are given. Measurements were taken of the composition, density, and cyclic variations of

gases in the high altitude thermosphere. Data were taken during the quiet magnetic period of August and early September 1969. E.H.W.

N72-33793* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW VIEW OF THE RING CURRENT c13
Masahisa Sugiura *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 62-66 refs (For availability see N72-33780 24-30)
CSCL 03B

Observations of the quiet time ring current intensity and distribution in the magnetosphere by OGO-3 and OGO-5 are given. The differences in quiet time ring currents and ring currents observed during magnetic storms are discussed. E.H.W.

N72-33794* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MAGNETOSPHERIC PLASMA TAIL c13
Joseph M. Grebowsky *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 67-70 (For availability see N72-33780 24-30)
CSCL 03B

The structural nature of the earth's plasmasphere at onset and immediately following an intense magnetic storm is examined. Thermal proton density measurements by the RF ion mass spectrometer on the low altitude polar orbiting satellite OGO-4 were compared on five consecutive nightside passes during the early recovery stage of an intense storm occuring in September 1967. Observational results revealed (1) characteristic termination of the dense plasmapause, (2) secondary enhancement of the ion density poleward of the first abrupt plasmapause, and (3) an elongated plasma tail during the recovery phase of the storm. E.H.W.

N72-33795* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC FIELD OBSERVATIONS OF THE DAYSIDE POLAR CUSP c13
Donald H. Fairfield *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 71-74 ref (For availability see N72-33780 24-30)
CSCL 03B

The magnetic field measurements made in the polar cusp region down to altitudes of about 4 earth radii are discussed. Measurements were made by the IMP 5 satellite. Measurements are characterized by unusually low magnitudes and large fluctuations. It was suggested that the low magnitudes are caused by currents of the magnetopause and the diamagnetic effect of the plasma. The transition between the magnetosheath and the cusp portion of the magnetosphere is not characterized by a well defined magnetopause as at low latitudes. E.H.W.

N72-33796* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT PROBE MEASUREMENTS OF dc ELECTRIC FIELDS FROM IMP 1 c13
Thomas L. Aggson *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 75-78 (For availability see N72-33780 24-30)
CSCL 03B

The measurement of dc electric fields in the magnetosphere by IMP 1 are presented. Electric fields on the order of 1 mV/m in the solar wind, with about a 40% jump at the bow shock were observed. Observational results are graphed. E.H.W.

N72-33797* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR WIND MAINTENANCE OF THE NIGHTTIME VENUS IONOSPHERE c29
Richard E. Hartle *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 79-82 ref (For availability see N72-33780 24-30)
CSCL 03B

An attempt is made to establish an ionization source capable of maintaining the nighttime Venus ionosphere. The corpuscular ionization and heating caused by the penetration of solar wind plasma into the nightside ionosphere was suggested as a possible source. Theoretical tests, using an interacting solar wind model, were made of the electron density and the results compared with observed electron density profiles. Results indicate the solar wind could maintain the nighttime ionosphere of Venus. E.H.W.

N72-33798* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ION CLUSTERS AND THE VENUS ULTRAVIOLET HAZE LAYER
Arthur C. Aikin *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 83-87 refs (For availability see N72-33780 24-30)
CSCL 03B

The daytime ionosphere of Venus is observed between 100 and 500 km altitude. Below 200 km, $CO2(+)$ is thought to be the principal ion unless oxygen is present. It was suggested that at altitudes less than 130 km the ion $CO2(+)$-CO2 is an important ionic constituent of the Venus ionosphere. Below 100 km, ion clustering processes combine with the low temperature at the mesopause to form coagulates giving rise to the ultraviolet haze layer which is frequently observed. Author

N72-33799* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON ESTIMATING THE VENUS SPIN VECTOR
Peter D. Argentiero *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 88-99 refs (For availability see N72-33780 24-30)
CSCL 03B

The improvement in spin vector and probe position estimates one may reasonably expect from the processing of such data is indicated. This was done by duplicating the ensemble calculations associated with a weighed least squares with a priori estimation technique applied to range rate data that were assumed to be unbiased and uncorrelated. The weighting matrix was assumed to be the inverse of the covariance matrix of the noise on the data. Attention is focused primarily on the spin vector estimation. Author

N72-33800* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFRARED SPECTRA OF CO2 IN THE ATMOSPHERES OF EARTH AND VENUS
William C. Maguire *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 100-103 (For availability see N72-33780 24-30)
CSCL 03B

A theoretical calculation was made of the CO2 infrared spectra of Earth and Venus atmospheres. The calculations cover line intensity, line shape, and line position. Theoretical results were compared with those observed by Nimbus 3 satellite and were found to be in reasonable agreement. E.H.W.

N72-33801* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HOT CO ON MARS
Michael J. Mumma *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 104-107 refs (For availability see N72-33780 24-30)
CSCL 03B

An attempt was made to measure the rotational temperature profiles and column density of the fourth positive bands of hot CO on Mars in the laboratory. Data were taken from Mariner 6 and 7 observations. Experimental results indicate that due to

high rotational temperatures and the dependence of that temperature on incident electron energy, the CO density in the fourth positive emission intensities cannot be determined. It was also determined that a wavelength resolution of 0.01 mm is needed to determine the profiles. The present Mariner has a resolution of only 0.75. E.H.W.

N72-33802* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THEORETICAL LIMITS ON JOVIAN RADIO BELTS
Fritz M. Neubauer *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 108-110 ref (For availability see N72-33780 24-30)
CSCL 03B

An attempt is made to establish safety limits for space missions near Jovian radio belts. A proton belt model was constructed and analyzed in an effort to set these limits based on the possible stability of radiation belts. Calculation results are graphed. E.H.W.

N72-33803* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESULTS FROM THE GSFC OSO 7 SPECTROHELIOGRAPH c29
Werner M. Neupert *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 111-116 (For availability see N72-33780 24-30)
CSCL 03B

The capabilities of the pointed spectroheliograph on board the OSO 7 are discussed. The range and results of the instrument in recording the evolution of solar active regions and solar flares are considered. K.P.D.

N72-33804* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSPORT OF COSMIC RAYS IN THE SOLAR CORONA c29
Kenneth H. Schatten *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 117-121 refs (For availability see N72-33780 24-30)
CSCL 03B

A method by which energetic cosmic ray particles in the interplanetary medium can diffuse in solar longitude. The method consists of particle motion occurring along current sheets separating discontinuous field structures in the corona. These sheets can serve as pathways along which energetic particles drift at nearly their propagation speed. A model of the coronal magnetic field and the large scale field behavior are analyzed. A mechanism by which particles can travel across the coronal magnetic field and arrive at the earth is suggested. Author

N72-33805* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR PARTICLE COMPOSITION MEASUREMENTS c29
Donald V. Reames *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 122-125 ref (For availability see N72-33780 24-30)
CSCL 03B

The composition of solar particle events, that is the relative abundance of different elements, was studied, using nuclear emulsion detectors flown on board sounding rockets. These observations were extended to elements as heavy as iron. A model is discussed in which the particles in a flare are stripped of electrons in the high temperature of a flare region, and subsequently are accelerated presumably by magnetic fields. Author

N72-33806* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CHARGE SPECTRA OF SOLAR COSMIC RAYS c29
Tycho T. VonRosenvinge *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 126-130 ref (For availability see N72-33780 24-30)
CSCL 03B

An approach to measuring charged spectra of solar cosmic rays is considered. These observations were made by a telescope on the IMP 6 satellite. The charge range was extended beyond charge 2 up to charge 26, and the energy range was extended to lower energies. The experiment preferentially selects rare events above charge 2 and gives them top priority for telemetry readout, thus breaking the monopoly that protons and helium nuclei otherwise would have on the telemetry. This effectively increases the number of nuclei observed above charge 2 by a factor of several hundred. Author

N72-33807* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TYPE 3 SOLAR RADIO BURSTS c29
Larry G. Evans *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 131-134 refs (For availability see N72-33780 24-30)
CSCL 03B

Using low frequency satellite observations, a direct comparison of the different theories is possible of the structure of the interplanetary medium. Measurements were made by satellite electron detectors in the same region of the interplanetary media where rapid drift type 3 solar radio bursts are generated. Results show, on the basis of this comparison, the general inadequacies of current type 3 burst theories and indicate a needed emphasis on formulating a new theory that is consistent with the low frequency observations. Representative observations from the RAE satellite are shown. The brightness temperature, which is a measure of the energy flux, versus frequency was plotted. Two events, a large burst and a large storm are also shown, each recorded at frequencies of 2.8 MHz and 700 KHz. High frequency curves obtained from ground-based observations are given. Author

N72-33808*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUIETTIME ELECTRON INCREASES c29
Lennard A. Fisk *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 135-138 ref (For availability see N72-33780 24-30)
CSCL 03B

The IMP spacecraft monitoring of the behavior of cosmic rays in the interplanetary medium is considered, especially the behavior of 0.5 to 1.9 pj (3 to 12 MeV) interplanetary electrons. A cosmic ray phenomenon was detected in the behavior of these electrons, and a possible explanation for this phenomenon is presented, which, if correct, gives clues about interplanetary conditions far beyond the orbit of the earth. Author

N72-33809*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY CHARGE AND ENERGY SPECTRA ABOVE 10 GeV c29
Jonathan F. Ormes *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 139-145 refs (For availability see N72-33780 24-30)
CSCL 03B

The composition and energy spectra of cosmic rays above 1.6 nJ (10 GeV) on balloons and ultimately on the HEAO satellite is discussed. Some results from a balloon flight in November of 1970 are presented. The instrument is shown schematically. It is designed to identify cosmic ray electrons, protons, and nuclei up through iron and to measure their energies. Author

N72-33810* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SURVIVAL OF HEAVY NUCLEI IN COSMIC RAY SOURCE ENVIRONMENTS c29

V. K. Balasubrahmanyan *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 146-150 (For availability see N72-33780 24-30)
CSCL 03B

Results from the Goddard balloon spectrometer and the results reported by Soviet scientists using the Proton series of satellites are summarized. The important experimental results from the balloon spectrometer experiment are as follows: (1) On a total-energy scale, protons constitute only a minor proportion of the cosmic rays, only 20 percent. The rest of the cosmic rays are complex nuclei. (2) All the nuclei have the same power low spectrum in total energy and so the composition seems to be independent of energy. Author

N72-33811* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NEUTRON STAR AS A QUANTUM CRYSTAL
Vittorio M. Canuto *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 151-154 (For availability see N72-33780 24-30)
CSCL 03B

The structure of the interior of neutron stars was examined. The equation of state for the interior of neutron stars was calculated. Author

N72-33812* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPRATHERMAL PROTON BREMSSTRAHLUNG c24
Frank C. Jones *In its* Significant Accomplishments in Sci., 1971 p 155-159 refs (For availability see N72-33780 24-30)
CSCL 20H

In the process of suprathermal proton bremsstrahlung a suprathermal proton, or if you prefer, simply an energetic proton, strikes a relatively motionless electron in a background plasma and causes the electron to radiate. The differential cross section as a function of energy of the emitted photon calculated was believed to be superior to the conventional one in the case of relativistic collisions. Author

N72-33813* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPERNOVAE STUDIED WITH A GROUND LEVEL ATMOSPHERIC FLUORESCENCE
David L. Bertsch *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 160-164 refs (For availability see N72-33780 24-30)
CSCL 03A

A monitoring experiment was undertaken late 1968 to search for photon bursts of extraterrestrial origin. The experiment and the results of the observations to date are summarized. The method of detection employs ground-based photomultiplier tubes which are sensitive to the secondary fluorescence light that would be produced when the primary pulse is absorbed in the atmosphere. Author

N72-33814* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSE X-RAYS FROM THE GALACTIC DISK c29
Peter J. Serlemitsos *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 165-169 (For availability see N72-33780 24-30)
CSCL 03B

An anisotropic feature of the diffuse hard X-ray background that tracks the concentration of interstellar hydrogen in the plane of the galaxy is reported. This feature supports a model of galactic X-ray emission by subrelativistic cosmic rays via a bremsttrahlung process. The measurement was carried out on August 9, 1971, using two multianode multilayer gas proportional counters onboard Aerobee 170 flight 13.08. A schematic diagram of the detectors is shown. This type of construction and the appropriate utilization of the signals from the many anodes result in a low detector background, a prerequisite before undertaking a measurement of possible small variations in the brightness of the X-ray sky. Author

N72-33815* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STELLAR X-RAY TEMPORAL VARIATIONS c29
Stephen S. Holt *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 170-174 (For availability see N72-33780 24-30)
CSCL 03B

Two separate theoretical models of X-ray sources were proposed, based on the premise that a pulsar can be hidden underneath a thick plasma cloud. The X-ray emission would come secondarily from the pulsar energy from the cloud underneath. Upper limits to the pulsed fraction for those conditions causing the most difficult detection of fluctuations are shown, along with power density and source of power spectra. J.A.M.

N72-33816* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERSTELLAR MEDIUM MODEL c29
James C. Novaco *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 175-179 refs (For availability see N72-33780 24-30)
CSCL 03B

A model of the ionized part of the interstellar medium was developed, based on the low frequency observations by the Radio Astronomy Explorer Satellite with a background of nonthermal radiation. This nonthermal background radiation is caused by synchrotron emission from cosmic ray electrons, and at low frequencies this emission is heavily absorbed by free-free absorption from the residual thermal electrons in the interstellar medium. By an appropriate model, parameters relevant to both the thermal and nonthermal components of the interstellar medium are shown. The observations were taken with the 100 deg dipole antenna and separated into galactic and extragalactic components. This model was developed using only the separated galactic component. Author

N72-33817* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SHAPE OF THE INTERSTELLAR REDDENING LAW
Michel Laget *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 180-184 refs (For availability see N72-33780 24-30)
CSCL 03A

The spectral distribution of pairs of stars within the same spectral type and luminosity class, one of which is reddened and the other unreddened is compared. It is assumed that the observed difference between two stars is only attributed to the interstellar medium. Their physical properties, size distribution of particles, geometrical shape, and their location in space are considered. Author

N72-33818* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERSTELLAR CO IN THE ULTRAVIOLET SPECTRUM OF ZETA OPHIUCHI
Andrew M. Smith *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 185-189 refs (For availability see N72-33780 24-30)
CSCL 03A

Optical methods in the vacuum ultraviolet were used to detect interstellar H2 in the spectrum of epsilon Persei; CO in the spectrum of zeta Ophiuchi was also observed. By contrast with radio results, the regions sampled are small, being one or a few clouds in the line of sight, and isotopic effects are detected in the spectrum. Author

N72-33819* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW INTENSITY H-BETA EMISSION FROM THE INTERSTELLAR MEDIUM c29
Ronald J. Reynolds *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 190-192 (For availability see N72-33780 24-30)
CSCL 03B

Pulsar pulse dispersions and low-frequency absorption of galactic and extragalactic radio sources strongly suggest that the interstellar medium is much more ionized than previously assumed. The search was confined to directions near pulsars because of the additional information provided by the dispersion measure which gives the total number of electrons along the line of sight to the pulsar. Of the four directions in which observations were made, an emission line appears to be present in at least two and possibly three directions. The data are shown from a low galactic latitude direction near the Crab Nebula pulsar. The observing direction was about 9 arcmin off the Crab with the field of view of about 1.5 arcmin. The number of counts was plotted versus the local standard of rest velocity and local standard wavelength of H-beta. Author

N72-33820* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
C-4 155 nm LINE IN BETA CEPHEI
David Fischel *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 193-196 (For availability see N72-33780 24-30)
CSCL 03A

The class of early B variable stars known as beta Cephei stars are characterized by short-period radial velocity and light variations. The coolest stars of this group have an effective temperature of about 20,000 K and the hottest, about 28,000 K. These stars are not related to the classical Cepheids whose temperatures are of the order of 6000 K. The amplitude of the radial velocity variation beta Cephei stars is in the tens of kilometers per second and the light variation is less than 0.2 mag, that is, less than 10 percent. The fastest pulsation interval is 3 hr and the slowest is 6 hr. The prototype beta Cephei has a period of 4 hr 34 min. Ultraviolet observations were taken using OAO 2 to investigate the relationship between the visual and the ultraviolet variations. Author

N72-33821* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GIANT LOOPS: A NEW KIND OF NEBULA
Stephen P. Maran *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 197-200 refs (For availability see N72-33780 24-30)
CSCL 03A

Four enormous, loop-shaped features were found in ground-based surveys of the low-frequency galactic radio emission. With diameters of 40 to 116 deg, they include the Cetus Arc and the North Polar Spur and were formerly called the radio spurs. Author

N72-33822* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY DUST AND COMET ORBITS
Robert G. Roosen *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 201-203 (For availability see N72-33780 24-30)
CSCL 03A

Several years of observational results are available from the Pioneer 8 and 9 interplanetary dust detectors, and these data were used to show dust counts graphically. The characteristics of the five largest dust showers are also summarized. J.A.M.

N72-33823* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVIDENCE ON THE COMPOSITION AND MINERALOGY OF THE LUNAR HIGHLANDS
Charles C. Schnetzler *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 204-207 (For availability see N72-33780 24-30)
CSCL 03B

Analyses of rare earth elements in various lunar samples are shown. The elements are listed in order of increasing atomic number, and the abundances are relative to primordial abundances as determined from stony meteorites. Analyses of soils from Apollo 11, 12, and 14 and Luna 16 missions are also shown. These elements show small regular differences in chemical and physical properties with atomic number. Author

N72-33824* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE APOLLO 15 X-RAY FLUORESCENCE EXPERIMENT c29
Isidore Adler *In its* Significant Accomplishments in Sci., 1971 Jun. 1972 p 208-213 (For availability see N72-33780 24-30)
CSCL 03B

The objectives of Apollo 15 X-ray fluorescence experiment were to obtain a partial chemical map of a large portion of the moon. Gamma ray and alpha particle experiments were also performed. Mapping information from approximately 150 deg east on the moon to about 50 deg west was secured. Secondary X-rays characteristic of silicon, aluminum, and magnesium were measured. Author

N72-33825*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
THE LUNAR SCIENCES NATURAL LANGUAGE INFORMATION SYSTEM Final Report
W. A. Woods, R. M. Kaplan, and B. Nash-Webber 13 Oct. 1972 388 p refs Supersedes BBN-2265 Prepared for Language Research Foundation
(Contract NAS9-11157)
(NASA-CR-128538; BBN-2378; BBN-2265) Avail: NTIS HC $21.50 CSCL 03B

The Lunar Sciences Natural Language Information System is an experimental, research prototype of a question-answering system to enable a lunar geologist to conveniently access, compare, and evaluate the chemical analysis data on lunar rock and soil composition that is accumulating as a result of the Apollo moon missions. Detailed descriptions are given of the analysis system, the English grammar it contains, and the general techniques and strategies of semantic interpretation used to interpret the meanings of the user's requests. Author

N72-33826*# Martin Marietta Corp., Denver, Colo.
OUTER PLANET ENTRY PROBE SYSTEM STUDY. VOLUME 1: SUMMARY Final Report
Aug. 1972 167 p refs Sponsored by NASA 3 Vol.
(Contract JPL-953311)
(NASA-CR-128336) Avail: NTIS HC $10.50 CSCL 22A

General mission considerations and science prospectus, which are of a general nature that applies to several or all planetary applications, are presented. Five probe systems are defined: nominal Jupiter probe system, and Jupiter probe-dedicated alternative probe system, Jupiter spacecraft radiation-compatible alternative probe system, Saturn probe system, and Saturn probe applicability for Uranus. Parametric analysis is summarized for mission analysis of a general nature, and then for specific missions to Jupiter, Saturn, Uranus, and Neptune. The program is also discussed from the hardware availability viewpoint and the aspect of commonality. Author

N72-33827*# Martin Marietta Corp., Denver, Colo.
OUTER PLANET ENTRY PROBE SYSTEM STUDY. VOLUME 2: SUPPORTING TECHNICAL STUDIES Final Report
Aug. 1972 519 p refs Sponsored by NASA 3 Vol.
(Contract JPL-953311)
(NASA-CR-128337) Avail: NTIS HC $28.00 CSCL 22A

The environment, science investigations, and general mission

analysis considerations are given first. These data are followed by discussions of the studies pertaining to the planets Jupiter, Saturn, Uranus, and Neptune. Except for Neptune, each planet discussion is divided into two parts: (1) parametric activities and (2) probe definition for that planet, or the application of a given probe for that planet. The Neptune discussion is limited to parametrics in the area of science and mission analysis. Each of the probe system definitions consists of system and subsystem details including telecommunications, data handling, power pyrotechnics, attitude control, structures, propulsion, thermal control, and probe to spacecraft integration. The first configuration is discussed in detail and the subsequent configuration discussions are limited to the differences. Finally, the hardware availability to support a probe system and commonality of science, missions, and subsystems for use at the various planets are considered.
Author

N72-33828*# Martin Marietta Corp., Denver, Colo.
OUTER PLANETARY PROBE SYSTEM STUDY. VOLUME 3: APPENDIXES Final Report
Aug. 1972 313 p refs Sponsored by NASA 3 Vol.
(Contract JPL-953311)
(NASA-CR-128338) Avail: NTIS HC $17.75 CSCL 22A

Supporting studies are presented on planetary atmospheres, communication and communication equipment, spacecraft subsystems, and weight analyses.
N.E.N.

N72-33829*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
METEOROID IMPACTS ON MARS AND THE SECONDARY PARTICLE ENVIRONMENT
Donald H. Humes and T. Dale Bess Washington Oct. 1972 38 p refs
(NASA-TN-D-6951; L-8479) Avail: NTIS HC $3.00 CSCL 03B

The degree to which the thin Martian atmosphere filters out meteoroids approaching the Martian surface was calculated by using a model of the meteoroid environment, a model of the Martian atmosphere, and equations of meteor physics. The secondary particle environment on the surface of Mars caused by the material ejected from meteoroid craters was modeled. The model consists of the mass distribution and the speed distribution of the secondary particles. Calculations were made of the penetration flux for aluminum structures on the Martian surface. The penetration hazard on the Martian surface was compared with the penetration hazard in space near Mars and on the lunar surface.
Author

N72-33830*# National Aeronautics and Space Administration, Washington, D.C.
TELESAT-A: PRESS KIT
Howard G. Allaway and Jim Lynch 3 Nov. 1972 11 p
(NASA-TM-X-68636) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740 CSCL 22C

General and background information are presented on the Telesat-A/Delta 92 flight plans. The Canadian domestic communications satellite is to be launched aboard the Delta rocket from Kennedy Space Center into a elliptical orbit, and a Telesat rocket will circularize the orbit at synchronous altitude over the equator at 109 deg west longitude. Characteristics of the satellite and launch vehicle, and the launch operations are described, and flight events are listed.
N.E.N.

N72-33831*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COMETS AND ASTEROIDS: A STRATEGY FOR EXPLORATION
May 1972 100 p refs
(NASA-TM-X-64677) Avail: NTIS HC $7.00 CSCL 03A

The initial phases in the genesis of the solar system are examined. Particular attention is given to asteroids and comets.
E.H.W.

N72-33832# Bell Telephone Labs., Inc., Whippany, N.J.
ELECTROSTATIC PROBE DATA FROM BELL SPHERE EXPERIMENT B09
Raymond W. Huggins Oct. 1972 16 p refs Presented at AIAA 5th Fluid and Plasma Dyn. Conf., Boston, Mass., 26-28 Jun. 1972 Backup document for AIAA Synoptic, "Electrostatic Probe Data from Bell Sphere B09 (Log No. J6683)" scheduled for publication in AIAA Journal in Mar. 1973
Avail: NTIS HC $3.00

Data were obtained from four electrostatic probes during the atmospheric reentry of the Bell Sphere experiment B09. The probe geometries and locations are given. Reduced electron density data from these four regions are presented, together with the theoretical models used. Other results presented include the electron-to-ion current ratios and the probe floating potentials.
Author

N72-33833*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LARGE SCALE PHOTOSPHERIC MAGNETIC FIELD: THE DIFFUSION OF ACTIVE REGION FIELDS Interim Report
Kenneth H. Schatten, Robert B. Leighton (Calif. Inst. of Tech., Pasadena), Robert Howard (Calif. Inst. of Tech., Pasadena), and John M. Wilcox (Stanford Univ., Calif.) Stanford, Calif. Stanford Univ. May 1972 15 p refs
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF GA-31138; NR Proj. 323-003)
(NASA-TM-X-68787; SU-IPR-472) Avail: NTIS HC $3.00 CSCL 03B

The large-scale phototospheric magnetic field was computed by allowing observed active region fields to diffuse and to be sheared by differential rotation in accordance with the Leighton (1969) magneto-kinematic model of the solar cycle. The differential rotation of the computed field patterns as determined by autocorrelation curves is similar to that of the observed photospheric field, and poleward of 20 deg. latitude both are significantly different from the differential rotation of the long-lived sunspots (Newton and Nunn, 1951) used as an input into the computations.
Author

N72-33834*# Techtran Corp., Glen Burnie, Md.
WHY SUPERNOVAE FLARE UP
G. S. Bisnovatyy-Kogan Washington NASA Oct. 1972 27 p refs Transl. into ENGLISH from Priroda (Moscow), no. 6, Jun. 1972 p 24-33
(Contract NASw-2037)
(NASA-TT-F-14607) Avail: NTIS HC $3.50 CSCL 03A

The origin and development of novae and supernovae are examined, with detailed description of chemical and physical events. Theories of development of supernovae and possible methods of prediction are presented as well.
Author

N72-33835*# Scientific Translation Service, Santa Barbara, Calif.
A LINEAR THEORY OF OPTIMIZATION PROBLEMS FOR ROCKETS WITH LOW THRUST
K. Kocher Washington NASA Oct. 1972 45 p refs Transl. into ENGLISH of "Einen lineare Theorie der Optimierungsprobleme bei Raketen mit kleinem Schub (Low Thrust)", Ph.D. Thesis Diss-4539, Eidgenoess. Tech. Hochschule, Zurich, 1971 64 p
(Contract NASw-2035)
(NASA-TT-F-14593; Diss-4539) Avail: NTIS HC $4.25 CSCL 22A

The coast arc trajectory problem is formulated. An interesting problem arises when the low thrust is turned off for a short time of the motion. The analytic closed form solution of the coast arc problem is presented, using the Stumpff c functions. The numerical integration of the propulsion phase is performed.
Author

N72-33836*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
APOLLO 14 MISSION REPORT. SUPPLEMENT 8:

SUMMARY OF APOLLO EXPERIMENTS ON LAUNCH PHASE ELECTRICAL PHENOMENA
Jul. 1972 35 p refs
(NASA-TM-X-68647; MSC-04112-Suppl-8) Avail: NTIS HC $3.75 CSCL 22C

An atmospheric electrical field experiment was conducted during Apollo 14 launch to measure the electrical perturbations produced by the space vehicle. The measurements showed the presence of a much stronger electrical field than was expected, and that the disturbance might be caused by a buildup of electrostatic charges in the launch vehicle engine exhaust clouds, charge buildup of the vehicle itself, or a combination of both. Efforts were also made to establish the origin and carriers of the charge. Author

N72-33837*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASURED MICROWAVE SCATTERING CROSS SECTIONS OF THREE METEORITE SPECIMENS
Wayne E. Hughes Washington Oct. 1972 14 p refs
(NASA-TN-D-7064; G-1073) Avail: NTIS HC $3.00 CSCL 03B

Three meteorite specimens were used in a microwave scattering experiment to determine the scattering cross sections of stony meteorites and iron meteorites in the frequency range from 10 to 14 GHz. The results indicate that the stony meteorites have a microwave scattering cross section that is 30 to 50 percent of their projected optical cross section. Measurements of the iron meteorite scattering were inconclusive because of specimen surface irregularities. Author

N72-33838# Lockheed Missiles and Space Co., Palo Alto, Calif.
SECULAR VARIATIONS IN THE GEOMAGNETIC FIELD OF THE 1965-1970 EPOCH FROM OBSERVATORY AND SATELLITE DATA
Sh. Sh. Dolginov, M. P. Ivchenko, V. P. Orlov, A. N. Pushkov, L. O. Tiurmina, and T. N. Cherevo 1972 10 p refs Transl. into ENGLISH from Geomagnetizm i Aeronomiya (Moscow), v. 12, no. 3, 1972 p 503-512
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The possibility is considered of using two satellite scans at different times to determine the secular variation of the absolute value of the total vector and the refinement of the secular variation component. The method elucidated was used to compile maps for the period 1965 to 1970. Author

N72-33839# California Univ., Livermore. Lawrence Livermore Lab.
OSO-4 ELECTRON OBSERVATIONS IN THE EDGE OF THE INNER RADIATION ZONE
Richard J. Knox 23 Feb. 1972 80 p refs
(Contract W-7405-eng-48)
(UCRL-51185) Avail: NTIS

Unidirectional electron flux intensities and differential energy spectra are reported, which were measured in March 1968 using a directional electron spectrometer on the OSO-4 spacecraft. Unidirectional differential intensities normal to the field line are given for E sub e > or 80.5 keV and for eight energy ranges to 5.33 MeV. Integral pitch angle distributions are presented. Pitch angle plots are also shown for November 1967 data. Favorable comparisons were made with LLL's OGO-5 electron energy spectra (March 1968), particularly at energies less than 1.0 MeV. Data were accumulated along the edge of the inner belt within a narrow band of lambda values that approached within a few degrees of the magnetic equator at the lower L values and increased to about 45 at the higher L values. It appears that the more complete analysis of OSO-4 electron data can, in part, fill a gap in the time history of inner zone electron events during the 1967-1968 time period. Author (NSA)

N72-33840# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
ORBIT DETERMINATION OF A NEAR-SYNCHRONOUS SATELLITE FROM PASSIVE RANGE
Vicent L. Pisacane, Raulo J. McCcnahy, Lauren L. Pryor, James M. Whisnant, and Harold D. Black May 1972 33 p refs
(Contract N00017-72-C-4401)
(AD-744929; APL-TG-1192) Avail: NTIS CSCL 22/3

An experiment is described by which the ephemeris of a near-synchronous satellite, designated 1967-66 F, has been determined from passive range observations. More precisely, the data consist of the measured times of reception at ground tracking stations of electromagnetic signals that are radiated from the satellite at time intervals regulated by an ultrastable free-running oscillator. The ground tracking stations number four and are located at Howard County, Maryland (USA), Misawa (Japan), Smithfield (Australia), and San Jose dos Campos (Brazil). An ephemeris and three satellite clock parameters are estimated by the procedure of differential correction in the method of least squares. A comparison of the ephemeris to one obtained from the Doppler tracking method is presented. This indicates that the accuracy of the ephemeris is better than 4.9 mrad rms, which was the goal of the orbit determination effort. Author (GRA)

N72-33841# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SPACE FLIGHT MECHANICS IN ELEMENTARY PRESENTATION
V. I. Levantovskii 6 Mar. 1972 620 p refs Transl. into ENGLISH of the publ. "Mekhanika Kosmicheskogo Poleta v Elementarnom Izlozhenii" Moscow, Nauka, 1970 p 1-491
(AF Proj. 4160)
(AD-743644; FTD-MT-24-924-71) Avail: NTIS CSCL 22/1

Contents: Fundamentals of rocket and space dynamics; Terrestrial flights; Flights to the moon; Interplanetary flights; Space flights. GRA

N72-33842# Lockheed Missiles and Space Co., Palo Alto, Calif.
ANALYSIS OF THE 1966 SOLAR ECLIPSE DATA Final Report, 1 Apr. 1970 - 30 Nov. 1971
Robert D. Sears 29 Feb. 1972 96 p refs
(Contract DASA01-70-C-0101)
(AD-744958; LMSC-D246526) Avail: NTIS CSCL 04/1

A study of the effects of the 12 November 1966 total solar eclipse upon the ionosphere has been conducted. The various sources of ionization in the D and E regions have been determined from measurements made during the eclipse period and from analytical models. In addition, the eclipse induced variations in the strength of the ionization source function with altitude during the eclipse has been modeled. Ionospheric measurements of positive ion species and total density, electron density, and O2(singlet Delta (g)) density and their variations during the eclipse were placed on a common eclipse-referenced coordinate system and these data were combined with a consistent data base for further studies. Author (GRA)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N72-33843*# General Electric Co., Philadelphia, Pa. Missile and Space Div.
MANNED SPACE FLIGHT NUCLEAR SYSTEM SAFETY. VOLUME 1: EXECUTIVE SUMMARY. PART 2: SPACE SHUTTLE NUCLEAR SYSTEM SAFETY Final Report

Jan. 1972 35 p refs
(Contract NAS8-26283)
(NASA-CR-123822; Doc-72SD4201-1-2-Vol-1-Pt-2) Avail: NTIS HC $3.75 CSCL 22B

The nuclear safety integration and operational aspects of transporting nuclear payloads to and from an earth orbiting space base by space shuttle are discussed. The representative payloads considered were: (1) zirconium hydride-Brayton power module, (2) isotope-Brayton power module, and (3) small isotope power systems or heat sources. Areas of investigation also include nuclear safety related integration and packaging as well as operational requirements for the shuttle and payload systems for all phases of the mission. Author

N72-33844*# North American Rockwell Corp., Downey, Calif. Space Div.
INFORMATION MANAGEMENT ADVANCED DEVELOPMENT. VOLUME 1: SUMMARY Information Management Advanced Development Final Report
C. R. Gerber et al 31 Jul. 1972 110 p refs
(NASA-CR-128554; SD-72-SA-0114 Vol-1) Avail: NTIS HC $7.50 CSCL 22B

The information management systems designed for the modular space station are discussed. Subjects presented are: (1) communications terminal breadboard configuration, (2) digital data bus breadboard configuration, (3) data processing assembly definition, and (4) computer program (software) assembly definition. Author

N72-33845*# North American Rockwell Corp., Downey, Calif. Space Div.
MODULAR SPACE STATION, PHASE B EXTENSION. INFORMATION MANAGEMENT ADVANCED DEVELOPMENT. VOLUME 2: COMMUNICATIONS TERMINAL BREADBOARD Final Report
C. R. Gerber 31 Jul. 1972 153 p refs
(Contract NAS9-9953)
(NASA-CR-128555; SD-72-SA-0114-Vol-2) Avail: NTIS HC $9.75 CSCL 22B

The design and development of the communications terminal breadboard for the modular space station are discussed. The subjects presented are: (1) history of communications terminal breadboard, (2) requirements analysis, (3) technology goals in terminal design, and (4) communications terminal board integration tests. Author

N72-33846*# North American Rockwell Corp., Downey, Calif. Space Div.
INFORMATION MANAGEMENT ADVANCED DEVELOPMENT. VOLUME 3: DIGITAL DATA BUS BREADBOARD Final Report
C. R. Gerber 31 Jul. 1972 187 p
(Contract NAS9-9953)
(NASA-CR-128556; SD-72-SA-0114-Vol-3) Avail: NTIS HC $11.50 CSCL 22B

The design, development, and evaluation of the digital data bus breadboard for the modular space station are discussed. Subjects presented are: (1) requirements summary, (2) parametric data for bus design, (3) redundancy concepts, and (4) data bus breadboard performance and interface requirements. Author

N72-33847*# North American Rockwell Corp., Downey, Calif. Space Div.
MODULAR SPACE STATION, PHASE B EXTENSION. INFORMATION MANAGEMENT ADVANCED DEVELOPMENT. VOLUME 4: DATA PROCESSING ASSEMBLY Final Report
C. R. Gerber 31 Jul. 1972 272 p
(Contract NAS9-9953)
(NASA-CR-128557; SD-72-SA-0114-Vol-4) Avail: NTIS HC $15.75 CSCL 22B

The computation and logical functions which are performed by the data processing assembly of the modular space station are defined. The subjects discussed are: (1) requirements analysis, (2) baseline data processing assembly configuration, (3) information flow study, (4) throughput simulation, (5) redundancy study, (6) memory studies, and (7) design requirements specification. Author

N72-33848*# North American Rockwell Corp., Downey, Calif. Space Div.
MODULAR SPACE STATION, PHASE B EXTENSION. INFORMATION MANAGEMENT ADVANCED DEVELOPMENT. VOLUME 5: SOFTWARE ASSEMBLY Final Report
C. R. Gerber 31 Jul. 1972 182 p
(Contract NAS9-9953)
(NASA-CR-128558; SD-72-SA-0114-Vol-5) Avail: NTIS HC $11.25 CSCL 22B

The development of uniform computer program standards and conventions for the modular space station is discussed. The accomplishments analyzed are: (1) development of computer program specification hierarchy, (2) definition of computer program development plan, and (3) recommendations for utilization of all operating on-board space station related data processing facilities. Author

N72-33849*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS TECHNOLOGY SATELLITES: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Mar. 1972 339 p refs
(NASA-TM-X-65871; X-460-72-87) Avail: NTIS HC $19.00 CSCL 22B

A scientific and technical bibliography is presented of documents published since 1965 pertaining to ATS. IAA, STAR, W abstracts are included. F.O.S.

N72-33850*# Fairchild Industries, Inc., Germantown, Md.
INTEGRATED DYNAMIC ANALYSIS SIMULATION OF SPACE STATIONS WITH CONTROLLABLE SOLAR ARRAY Final Report
Joseph A. Heinrichs and Joseph J. Fee (Wolf Res. and Develop. Corp.) Sep. 1972 105 p refs
(Contract NAS1-10155)
(NASA-CR-112118) Avail: NTIS HC $7.25 CSCL 22B

A methodology is formulated and presented for the integrated structural dynamic analysis of space stations with controllable solar arrays and non-controllable appendages. The structural system flexibility characteristics are considered in the dynamic analysis by a synthesis technique whereby free-free space station modal coordinates and cantilever appendage coordinates are inertially coupled. A digital simulation of this analysis method is described and verified by comparison of interaction load solutions with other methods of solution. Motion equations are simulated for both the zero gravity and artificial gravity (spinning) orbital conditions. Closed loop controlling dynamics for both orientation control of the arrays and attitude control of the space station are provided in the simulation by various generic types of controlling systems. The capability of the simulation as a design tool is demonstrated by utilizing typical space station and solar array structural representations and a specific structural perturbing force. Response and interaction load solutions are presented for this structural configuration and indicate the importance of using an integrated type analysis for the predictions of structural interactions. Author

N72-33851# National Environmental Satellite Service, Washington, D.C.
EFFECT OF ORBITAL INCLINATION AND SPIN AXIS ATTITUDE WIND ESTIMATES FROM PHOTOGRAPHS BY GEOSYNCHRONOUS SATELLITES
Linwood F. Whitney, Jr. Sep. 1972 35 p refs
(NOAA-TM-NESS-41) Avail: NTIS HC $3.75

Quantitative evidence is presented which demonstrates the serious effect of inclination and spin axis attitude on the accuracy of cloud vectors derived from the animation of pictures photographed by geosynchronous satellites. Orbital inclination causes the subpoint to move, while certain orientations of the spin axis cause the camera to change its orientation relative to the earth. Errors in the apparent cloud vectors due to subpoint motion are generally somewhat more serious than those due to changing camera orientation. Orbital inclination, which is uncontrolled in existing geosynchronous satellites, steadily worsens with time; consequently, the errors of subpoint motion often approach the magnitude of the cloud vectors. Author

N72-33852*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF RECOVERABLE SINGLE AND MULTIPLE SPACE TUGS FOR MISSIONS BEYOND EARTH ESCAPE
Arthur V. Zimmerman 1972 18 p refs Presented at 1972 JANNAF Propulsion Meeting, New Orleans, 27-29 Nov. 1972
(NASA-TM-X-68136) Avail: NTIS HC $3.00 CSCL 22C

A recoverable space tug launched by the space shuttle to provide the required post-orbital propulsion needed for placement of unmanned satellites is described. The space tug will also be used to launch interplanetary spacecraft from low earth orbit. The performance of single and multiple space tugs (in tandem) for launching spacecraft beyond earth escape is summarized. Trajectories are developed that allow recovery of the tugs whenever practical. The effects of important tug and trajectory parameters on performance are presented. It is concluded that a single tug can inject spacecraft to Mars or Venus and still be recovered. The use of several tugs in tandem can provide a significant increase in capability over the use of a single tug. The more difficult missions involve a mix of recovered and expended tugs. Author

N72-33853*# Massachusetts Inst. of Tech., Cambridge. Charles Stark Draper Lab.
CSM DOCKED DAP/ORBITAL ASSEMBLY BENDING INTERACTION-AXIAL CASE Final Report
Joseph F. Turnbull and James E. Jones Jul. 1972 61 p refs
(Contract NAS9-4065; DSR Proj. 55-23890)
(NASA-CR-128543; E-2704) Avail: NTIS HC $5.25 CSCL 22B

A digital autopilot which can provide attitude control for the entire Skylab orbital assembly using the service module reaction control jets is described. An important consideration is the potential interaction of the control system with the bending modes of the orbital assembly. Two aspects of this potential interaction were considered. The first was the possibility that bending induced rotations feeding back through the attitude sensor into the control system could produce an instability or self-sustained oscillation. The second was whether the jet activity commanded by the control system could produce excessive loads at any of the critical load points of the orbital assembly. Both aspects were studied by using analytic techniques and by running simulations on the all-digital simulator. Author

N72-33854*# Cornell Univ., Ithaca, N.Y. College of Engineering.
JOSE, JUPITER ORBITING SPACECRAFT: A SYSTEMS STUDY, VOLUME 1
Oct. 1971 477 p refs
(Grant NGR-33-010-071)
(NASA-CR-128358) Avail: NTIS HC $26.00 CSCL 22B

A brief summary of the mechanical properties of Jupiter is presented along with an organizational outline of the entire JOSE program. Other aspects of the program described include: spacecraft design, mission trajectories, altitude control, propulsion subsystem, on-board power supply, spacecraft structures and environmental design considerations, and telemetry. F.O.S.

N72-33855*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MARINER MARS 1971 DATA STORAGE SUBSYSTEM Final Report
R. Grumm 15 Sep. 1972 33 p refs
(Contract NAS7-100)
(NASA-CR-128341; JPL-TM-33-554) Avail: NTIS HC $3.75 CSCL 22B

A digital tape recorder was used on the Mariner Mars 1971 spacecraft to record television and scientific data. Data were recorded at 132 kilobits/sec and were reproduced at one of five available rates (16.2, 8.1, 4.05, 2.05, or 1.0125 kilobits/sec) selected by ground command to be congruous with the spacecraft-to-earth communications link performance. The transport mechanism contained 167 m of 1.2 cm magnetic recording tape. A single motor was used to drive the peripheral drive transport. During development of the design, stick slip problems were encountered. A design life of 2400 tape passes was achieved during the mission. Author

N72-33856*# Chrysler Corp., New Orleans, La. Space Div.
SPACE SHUTTLE: MSFC BOOSTER (B-005) LOW SPEED STATIC STABILITY AND LANDING INVESTIGATION, HIGH SPEED GRIT STUDY
Dana E. Heim and Paul E. Ramsey Jun. 1970 1082 p refs
(Contract NAS8-4016)
(NASA-CR-103150; DMS-DR-1001) Avail: NTIS HC $56.25 CSCL 22B

An experimental wind tunnel investigation on the Marshall Space Flight Center's (MSFC) booster configuration of the space shuttle system is discussed. Tests were conducted in the MSFC 14' x 14' trisonic wind tunnel. Parameters investigated include: (1) a landing study at Mach number of .3 with the booster at three discrete heights above a ground plane (maximum height above ground plane was six inches) and (2) a static stability study at subsonic Mach numbers, which included eleven deflections of 0, 10, 20 and 30 degrees with canard deflections of 0, 5, 10 and 15 degrees. Both a trapezoidial and a delta shaped canard were investigated at the above conditions; a grit size study was made over the entire Mach range from .3 to 5.0. Author

N72-33857*# Brunswick Corp., Lincoln, Nebr. Technical Products Div.
LOW-COST FABRICATION METHOD FOR ABLATIVE HEAT SHIELD PANELS FOR SPACE SHUTTLES
Harry T. Abbott [1972] 124 p
(Contract NAS1-9945)
(NASA-CR-111835) Avail: NTIS HC $8.25 CSCL 22B

Space shuttles will require a reliable, low-cost thermal protection system to survive the re-entry environment. Replaceable ablative panels, prefabricated for attachment to the external surface of the vehicle, can adequately provide the necessary protection. The development and application is described of a low-cost compression molding process for this type of ablative panel. Flat and curved panels of four different ablative compositions were fabricated. Detailed fabrication procedures, material costs, fabrication hours for all processes, costs of fabricated panels, and estimated costs for various panel sizes, shapes and quantities are presented. Author

N72-33858*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A PASSIVE BALANCER FOR A CLASS OF ROTATING SPACECRAFT
C. William Martz and Carolyn Grantham Washington Oct. 1972 99 p refs
(NASA-TN-D-6924; L-8282) Avail: NTIS HC $3.00 CSCL 22B

Equations of motion are derived for a flexibly connected dual-spin spacecraft equipped with four pendulumlike passive controllers for mass balance and spin axis control. These equations are constrained and used to determine the conditions required for successful steady-state operation of the controllers

with a spinning, rigid-body spacecraft. Generalized controller sizing criteria are derived and related to limiting values of system time constant for an example spacecraft unbalance condition. A generalized real-time computer simulation of a large, slowly spinning rigid-body spacecraft equipped with passive controllers is also presented. Numerical results of this simulation show that passive controllers can successfully balance a class of rotating rigid bodies undergoing large internal mass and inertial disturbances. The ratio of total controller mass to spacecraft mass need not be greater than 1 to 2 percent. Author

N72-33859*# National Aeronautics and Space Administration, Washington, D.C.
GAMMA RAY SATELLITE TO BE LAUNCHED FROM AFRICA
Howard G. Allaway and Ken Senstad 29 Oct. 1972 22 p
(NASA-News-Release-72-204) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740 CSCL 22B

The announcement is presented of the launch of NASA's Small Astronomy Satellite B (SAS-B) on 2 Nov. 1972, to study gamma rays. The launch is to be from the Italian-operated San Marco Equatorial Range in the Indian Ocean for ease in acquiring an equatorial orbit. The spacecraft systems described include: stabilization and control, communication, and spark chamber gamma ray telescope. The results of Uhuru (Explorer 42) are also presented. F.O.S.

N72-33860*# National Aeronautics and Space Administration, Washington, D.C.
MAJOR SKYLAB ELEMENTS AT LAUNCH SITE
Bill Pomeroy Oct. 1972 7 p
(NASA-TM-X-68639) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740 CSCL 22D

The preparations for launching the Skylab space station are discussed. The composition of the Skylab and Saturn 5 launch vehicle is described. The missions of the Skylab while in earth orbit are examined. The procedures for accomplishing the intended space mission are outlined. P.N.F.

N72-33861*# National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
SPACE SHUTTLE BASELINE ACCOMMODATIONS FOR PAYLOADS
27 Jun. 1972 69 p
(NASA-TM-X-68642; MSC-06900) Avail: NTIS HC $5.50 CSCL 22B

The space shuttle system as it relates to payloads is described. This study provides potential users of the space shuttle with a uniform base of information on the accommodations between the payload and the shuttle. By utilizing this information, preliminary payload planning and design studies can be evaluated and compared against a common set of shuttle/payload accommodations. This information also minimizes the necessity for each payload study to develop information on the shuttle configuration. Author

N72-33862*# Techtran Corp., Glen Burnie, Md.
MARS 2 AND 3: INTERPLANETARY STATIONS OF THE USSR
R. Hofstaetter Washington NASA Oct. 1972 12 p Transl. into ENGLISH from Flug Rev. Int. (West Germany), no. 3, Mar. 1972 p 41-45
(Contract NASw-2037)
(NASA-TT-F-14256) Avail: NTIS HC $3.00 CSCL 22B

The design and construction of the Soviet Mars 2 and 3 probes, with comprehensive details on instrumentation and orbital parameters, are described. Author

N72-33863*# Techtran Corp., Glen Burnie, Md.
MARINER 9: THE FIRST ARTIFICIAL MARS SATELLITE
H. W. Koehler Washington NASA Oct. 1972 9 p Transl. into ENGLISH from Flug-Rev. (West Germany), no. 5, Mar. 1972 p 37-40
(Contract NASw-2037)
(NASA-TT-F-14221) Avail: NTIS HC $3.00 CSCL 22B

While the first photographs transmitted from our neighboring planet by the Mariner 9 artificial Mars satellite left something to be desired as far as quality is concerned, the pictures transmitted during December have shown considererable improvement. The scientists at the Jet Propulsion Laboratory have found that the sandstorm that was raging at the start of the mission has begun to die down and the pictures are consequently becoming clearer. It is already becoming apparent that Mars is not a dead planet but one which is in a state of development. Once again space travel has made a significant contribution to the study of the universe with Mariner 9. Author

N72-33864*# Martin Marietta Corp., Denver, Colo.
SPACE STORABLE PROPELLANT ACQUISITION SYSTEM
James R. Tegart, Preston E. Uney, John E. Anderson, and Dale A. Fester Oct. 1972 287 p refs Prepared for JPL
(Contract NAS2-6548)
(NASA-CR-114493) Avail: NTIS HC $16.50 CSCL 22B

Surface tension propellant acquisition concepts for an advanced spacecraft propulsion system having a 10-year mission capability were investigated. Surface tension systems were specified because they were shown to be the best propellant acquisition technique for various interplanetery spacecraft in a prior study. A variety of surface tension concepts for accomplishing propellant acquisition were formulated for the baseline space storable propulsion module and Jupiter Orbiter mission. Analyses and evaluations were then conducted on each candidate concept to assess fabricability, performance capability, and spacecraft compatibility. A comparative evaluation of the results showed the Fruhof-class of low-g surface tension systems to be preferred for these interplanetary applications. Author

N72-33865*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFORMATION TRANSFER SATELLITE Summary Report
Edgar M. VanVleck Jul. 1972 138 p
(NASA-TM-X-62190) Avail: NTIS HC $9.00 CSCL 22B

A general summary of INFOSAT development is presented. The objectives and goals, systems analysis methodology, tradeoffs, and missions are discussed. Conclusions for future developments are included. F.O.S.

N72-33866*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRENDS IN NASA COMMUNICATION SATELLITES
Joseph N. Sivo, William H. Robbins, and D. Michael Stretchberry 1972 27 p refs Presented at 13th Ann. Inst. on World Affairs, San Diego, Calif., 7-25 Aug. 1972
(NASA-TM-X-68141; E-7144) Avail: NTIS HC $3.50 CSCL 22B

Satellite telecommunications can help to satisfy several national needs such as education, health care, cultural opportunities, and data transfer. There are current experiments being conducted with NASA spacecraft ATS 1, 3, and 5 in an attempt to satisfy these national needs. Future experiments are planned for the ATS F/G and CTS spacecrafts. The next generation of communications satellites must provide multiple region coverage, multichannel capability, high quality TV pictures, and must allow low cost ground receivers to be used. The proposed NASA spacecrafts, ATS H/I, will satisfy these requirements. Other countries of the world can benefit from ATS H/I technology. Author

N72-33867*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.
SATELLITE AUXILIARY-PROPULSION SELECTION TECH-

NIQUES. APPLICATIONS OF SELECTION TECHNIQUES TO THE ATS-H SATELLITE
Lee B. Holcomb 1 Oct. 1972 38 p refs
(Contract NAS7-100)
(NASA-CR-128380; JPL-TR-32-1505-Suppl-1) Avail: NTIS HC $4.00 CSCL 22B

The analysis required to estimate auxiliary-propulsion system requirements for a mission which includes tipoff rate reduction, acquisitions, disturbance torques, orbital disturbances, and spacecraft commanded maneuvers is presented. The comparison of several candidate auxiliary-propulsion systems and system combinations for an advanced applications technology satellite (ATS-H) is described. A generalized auxiliary-propulsion system tradeoff, based on mission cost effectiveness criteria, is examined. The specific mission assumptions for the ATS-H spacecraft are included, along with a discussion of the sensitivity of the final selection to these assumptions. Author

N72-33868# Lockheed Missiles and Space Co., Palo Alto, Calif.
IMAGE READOUT SYSTEM OF THE PHOTO-TELEVISION UNITS OF THE AUTOMATIC INTERPLANETARY PROBES MARS-2 AND MARS-3
M. K. Naraeva, I. A. Telegin, and T. L. Kulakova 1972 4 p refs
Transl. into ENGLISH from Optiko-Mekh. Prom. (Leningrad), no. 7, 1972 p 27-29
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The operating principles of the optico-mechanical sweep unit of the photo-television apparatus of the Mars 2 and Mars 3 are described. The choice of the apparatus lens is given a foundation. Results are presented of an experimental checkout of the system. Author

N72-33869*# Chrysler Corp., New Orleans, La. Space Div.
AN INVESTIGATION OF THE LANDING CHARACTERISTICS OF THE NASA-MSC AUGUST 1969 BASELINE ORBITER CONFIGURATION IN GROUND EFFECT
Edmond B. Chambliss and David Millikan Oct. 1972 130 p
(Contract NAS8-4016)
(NASA-CR-120023; DMS-DR-1205) Avail: NTIS HC $8.50 CSCL 22B

A 0.05 scale model of the NASA-MSC August 1969 baseline shuttle craft was tested in Texas A&M University's 7- x 10-foot low speed wind tunnel facility. The purpose of the test was to determine the landing aerodynamic characteristics of the shuttle craft vehicle in ground effect and to evaluate control surface hinge moments experienced in the cruise and landing operational phases of flight. Analysis of the final data will allow evaluation of vehicle flight stability in ground effect and estimation of vehicle control surface power system requirements. Author

N72-33870*# Chrysler Corp., New Orleans, La. Space Div.
PERFORMANCE, STATIC STABILITY, AND CONTROL EFFECTIVENESS OF A PARAMETRIC SPACE SHUTTLE LAUNCH VEHICLE
Robert E. Buchholz and Mickey Gamble Oct. 1972 572 p ref
(Contract NAS8-4016)
(NASA-CR-120074; DMS-DR-1272) Avail: NTIS HC $30.75 CSCL 22D

This test was run as a continuation of a prior investigation of aerodynamic performance and static stability tests for a parametric space shuttle launch vehicle. The purposes of this test were: (1) to obtain a more complete set of data in the transonic flight region, (2) to investigate new H-0 tank noseshapes and tank diameters, (3) to obtain control effectiveness data for the orbiter at 0 degree incidence and with a smaller diameter H-0 tank, and (4) to determine the effects of varying solid rocket motor-to-H0 tank gap size. Experimental data were obtained for angles of attack from -10 to +10 degrees and for angles of sideslip from +10 to -10 degrees at Mach numbers ranging from .6 to 4.96. Author

N72-33871*# Chrysler Corp., New Orleans, La. Space Div.
AERODYNAMIC STABILITY AND CONTROL CHARACTERISTICS OF TBC SHUTTLE BOOSTER AR-11981-3
E. R. Phelps, L. L. Watts, and R. W. Ainsworth Oct. 1972 984 p
(Contract NAS8-4016)
(NASA-CR-120003; DMS-DR-1160) Avail: NTIS HC $51.25 CSCL 22B

A scale model of the Boeing Company space shuttle booster configuration 3 was tested in the MSFC 14-inch trisonic wind tunnel. This test was proposed to fill-in the original test run schedule as well as to investigate the aerodynamic stability and control characteristics of the booster with three wing configurations not previously tested. The configurations tested included: (1) a cylindrical booster body with an axisymmetric nose, (2) clipped delta canards that had variable incidence from 0 deg to -60 deg, (3) different aft body mounted wing configurations, (4) two vertical fin configurations, and (5) a Grumman G-3 orbiter configuration. Tests were conducted over a Mach range from 0.6 to 5.0. Author

N72-33872*# Ithaco, Inc., Ithaca, N.Y.
DEVELOPMENT AND FABRICATION OF A CHARGEABLE MAGNET SYSTEM FOR SPACECRAFT CONTROL Final Report
27 Jul. 1972 195 p
(Contract NAS5-21170)
(NASA-CR-130077) Avail: NTIS HC $11.75 CSCL 22B

The design of variable permanent magnets for use in magnetic balancing and control of earth orbiting spacecraft is discussed. These magnets can be used instead of air coils or electromagnets in applications where the objective is to produce, or eliminate, torque on the spacecraft through interaction with the earth's magnetic field. The configuration of the magnet for minimum size and weight is described. Author

N72-33873# Royal Aircraft Establishment, Farnborough (England).
UK5: A SPACECRAFT FOR EXPERIMENTS IN X-RAY ASTRONOMY
E. C. Semple Nov. 1971 21 p
(RAE-TR-71228; BR-28585) Avail: NTIS HC $3.25

UK5 is the fifth in the series of spacecraft built for the Science Research Council of the United Kingdom, and carries six experiments to investigate the spatial distribution and energy spectra of emissions from X-ray sources in space, and the diffuse X-ray background. Studies will also be made of the polarization of X-ray emissions and of any pulsar periodicities. Most of the experiments view areas of sky along the spin axis of the spacecraft. To be able to vary the pointing direction, the spin axis can be precessed by an on-board attitude control system. The design of the spacecraft and the method by which it will be controlled in orbit, are outlined. Author (ESRO)

N72-33874# Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF DIRECT SOLAR RADIATION ON THE ATTITUDE OF THE SKYNET SPACECRAFT
G. J. Davison and R. H. Merson Mar. 1972 26 p refs
(RAE-TR-72044; BR-28658) Avail: NTIS HC $3.50

Analytical expressions are derived for the forces and torques acting on a spin stabilized cylindrical satellite due to direct solar radiation. These expressions are then used to determine the effects of direct solar radiation on the attitude and orbit of the Skynet spacecraft, and a comparison is made with the observed behavior of the spacecraft. Author (ESRO)

N72-33875# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.
STOPWATCH OBSERVATIONS OF SATELLITES, JUNE 1972
R. D. Eberst 18 Jul. 1972 18 p

(ROE-STS-127) Avail: NTIS HC $3.00

Stopwatch observations made at stations connected with the section during June 1972 are listed in launch and time order for each satellite. Various subtotals are given. Author (ESRO)

N72-33876# Royal Observatory, Edinburgh (Scotland).
STOPWATCH OBSERVATIONS OF SATELLITES, JULY 1972
R. D. Eberst 17 Aug. 1972 22 p
(ROE-STS-128) Avail: NTIS HC $3.25

Stopwatch observations made at stations connected with the section during July 1972 are listed in launch and time order for each satellite. Various sub-totals are given. Author (ESRO)

N72-33877# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
USE OF THE POST-APOLLO TRANSPORTATION ELEMENTS IN THE PERFORMANCE OF HIGH-ENERGY SOLAR SYSTEM EXPLORATION MISSIONS (HESSEM) Summary and Final Presentation
30 May 1972 95 p
(Contract ESTEC-1515/71-EL)
(MBB-URV-52(72)S; ESRO-CR(P)-122-Summ) Avail: NTIS HC $6.75

A summary is presented of the use of the post-Apollo space shuttle and tug for the transportation of high energy solar system probes. Possible interplanetary missions are: (1) near solar probe, (2) Mercury orbiter/lander, (3) lunar exploration module, (4) Mars retriever, (5) out-of-ecliptic probe, (6) asteroid rendezvous probe,(7)cometary probe, (8)Jupiter satellite,(9)Saturn satellite, and (10)outer solar system telescope. The launch mode alternatives for these probes, using shuttle and tug, shuttle and existing stages, and expendable launch vehicles, are compared as to costs. The out-of-ecliptic probe mission is investigated in detail. Author (ESRO)

N72-33878# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
USE OF POST-APOLLO TRANSPORTATION ELEMENTS IN THE PERFORMANCE OF HIGH-ENERGY SOLAR SYSTEM EXPLORATION MISSIONS (HESSEM) Final Report
Jun. 1972 161 p
(Contract ESTEC-1515/71-EL)
(MBB-URV-52(72); ESRO-CR(P)-122) Avail: NTIS HC $10.25

The possibilities are demonstrated of using post-Apollo space tugs and shuttles as a means of transportation for nine high energy interplanetary missions and as a lunar autonomous exploration module. The missions under discussion are: near solar artificial satellite, Mercury orbiter/lander, lunar exploration module, Mars retriever, out-of-ecliptic probe, asteroid rendezvous probe, cometary probe, Jupiter satellite, Saturn satellite, outer solar system telescope platform. The out-of-ecliptic probe is discussed in detail. Author (ESRO)

N72-33879# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
APPLICATION OF LINEAR FILTERING TECHNIQUES TO THE ATTITUDE RESTITUTION OF SPINNING SATELLITES [APPLICATION DES TECHNIQUES LINEAIRES DE FILTRAGE A LA RECONSTITUTION D'ATTITUDE DE SATELLITES EN ROTATION]
H. T. Huynh and F. Depasse May 1972 254 p refs In FRENCH; ENGLISH summary
(Contract ESTEC-1179/70)
(ONERA-NT-1/1935-SY; ESRO-CR(P)-121) Avail: NTIS HC $14.75

Modifications are proposed to reduce the effect on nonlinearities and identify discrepancies observed for the error covariance matrix and nonconvergent phenomena. There effects are obtained by digital simulation of satellite attitude restitution using the Kalman-Bucy filtering technique and during angular momentum measurement performed by solar and earth sensors. The measurement nonlinearities are presented. A detailed analysis of the estimator behavior in the presence of measurement nonlinearities is given and modifications are developed to reduce the nonlinear effects by applying Denham-Pines and recycling methods. Calculations for nutation and inertia ratio estimation are given. Author (ESRO)

N72-33880# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AVIATION ON THE THRESHOLD OF SPACE, CHAPTER 9
A. N. Ponomarev 2 May 1972 40 p Transl. into ENGLISH from the publ. "Aviatsiya na Poroge v Kosmos" USSR, 1971 p 284-315
(AD-745242; FTD-MT-24-1461-71) Avail: NTIS CSCL 22/2

The document discusses general problems and progress thus far involving space-aircraft or lifting bodies. All sources quoted are from U.S. publications except for one French reference to a space station. Vehicles described include the Dyna Soar, X-15, SV-5D, X-24A, HL-10, and a U.S. orbital space station. Problems discussed include heat-shielding, methods of control, speeds, and power sources. Author (GRA)

N72-33881# Aerospace Research Labs., Wright-Patterson AFB, Ohio. General Physics Research Lab.
GEOMETRIC INTERPRETATION OF OPTICAL PHOTOMETRY OF SPECULAR OVALOID SATELLITES WITH UNIFORM ALBEDO
Louis A. Tamburino May 1972 20 p refs
(AF Proj. 7114)
(AD-744835; ARL-72-0063) Avail: NTIS CSCL 22/2

The paper considered the inverse scattering problem for photoelectric measurements of reflected sunlight from specular ovaloid satellites. The scattered intensity is shown to be inversely proportional to the Gaussian curvature, which is similar to the dependence of radar cross sections for conducting bodies in the geometrical optics limit. The differential equation relating shape to curvature maps is derived and the limitations of its application discussed. Author (GRA)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N72-33882 Engineering Sciences Data Unit, London (England).
BUCKLING STRESS RATIOS FOR FLAT PLATES UNDER SHEAR AND NON-UNIFORM COMPRESSION
Jan. 1970 6 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-70002) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

During deceleration from supersonic flight, transient thermal compressive stresses are set up in an aircraft panel. The stress distribution is approximated by a parabola and the mean temperature in the middle of the plate is 100 C. The shear stress at which the panel will first buckle was determined. Author

N72-33883 Engineering Sciences Data Unit, London (England).
LOCAL BUCKLING OF COMPRESSION PANELS WITH UNFLANGED INTEGRAL STIFFENERS
Jan. 1970 7 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-70003) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The interaction between the skin and stiffener was taken into account in a determination of local buckling stress of a panel with unflanged integral stiffeners. The panel is to be manufactured from an aluminum alloy. K.P.D.

N72-33884 Engineering Sciences Data Unit, London (England).
ELASTIC STRESSES AND DEFLECTIONS FOR LONG FLAT RECTANGULAR PLATES UNDER UNIFORMLY DISTRIBUTED AND LINEARLY VARYING NORMAL PRESSURE
Jul. 1969 22 p refs Supersedes ESDU-Struct-02.09.03, ESDU-Struct-02.09.04, ESDU-Struct-02.09.08, ESDU-Struct-02.09.09, ESDU-Struct-02.09.10, ESDU-Struct-02.09.11, ESDU-Struct-02.09.12, ESDU-Struct-02.09.15 and in part ESDU-Struct-02.09.01, ESDU-Struct-02.09.02., ESDU-Struct-02.09.06, ESDU-Struct-02.09.07 Sponsored by Roy. Aeron. Soc.
(ESDU-69018; ESDU-Struct-02.09.093; ESDU-Struct-02.09.04; ESDU-Struct-02.09.08; ESDU-Struct-02.09.09; ESDU-Struct-02.09.10; ESDU-Struct-02.09.11; ESDU-Struct-02.09.12; ESDU-Struct-02.09.15; ESDU-Struct-02.09.01; ESDU-Struct-02.09.02; ESDU-Struct-02.09.06; ESDU-Struct-02.09.07) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7 AD

Curves are given which enable the stresses and deflections to be determined for initially flat rectangular plates of uniform thickness under pressure which is constant along the length and either uniformly distributed or varying linearly from zero to maximum pressure across the width. The stresses and deflections for plates having a pressure varying linearly across the width from minimum to maximum pressure may also be obtained by using a simple formula. Author

N72-33885 Engineering Sciences Data Unit, London (England).
THE DEFLECTIONS AND SLOPES OF SHAFTS OR BEAMS OF CONSTANT OR STEPPED CROSS SECTION
Jun. 1969 22 p ref Sponsored by Roy. Aeron. Soc.
(ESDU-69017) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A method is presented for calculating the slope and deflection at any point along the length of a shaft or beam of constant or stepped cross section under any number of point loads, distributed loads, and applied moments. The calculation procedure is initially described for cases in which the shaft is simply supported and carries point loads and moments in one plane. A means is then given for extending the procedure to include treatment of uniformly distributed loads, overhung loads, shafts supported on three bearings, and out-of-plane loads. The procedure is based on an approximation whereby the inertia of the shaft is fitted by a Fourier series. The method is equally applicable to shafts stepped by machining and to shafts with shrunk-on collars of the same modulus of elasticity. Author

N72-33886 Engineering Sciences Data Unit, London (England).
ELASTIC STRESS CONCENTRATION FACTORS: GEOMETRIC DISCONTINUITIES IN RODS AND TUBES OF ISOTROPIC MATERIALS
Aug. 1969 22 p refs Supersedes in part ESDU-65004 Sponsored by Roy. Aeron. Soc.
(ESDU-69021; ESDU-65004) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Data are presented on stress concentration effects occurring in rods and tubes when they are loaded in tension, bending, or torsion. A stress concentration factor is defined as the ratio of the highest stress to a reference stress calculable from simple theory. The data are given for various geometries with discontinuites, and apply only to isotropic materials that obey Hooke's Law. Author

N72-33887 Engineering Sciences Data Unit, London (England).
DESIGN FOR MINIMUM WEIGHT COMPRESSION PANELS WITH UNFLANGED INTEGRAL STIFFENERS
Sep. 1969 16 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-69014) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The cross sectional dimensions for the minimum weight of uniform elastic or inelastic compression panels having unflanged integral stiffeners are given. Data are also given for determining the dimensions of the panel of least weight when one of the cross sectional dimensions is restricted. Author

N72-33888 Engineering Sciences Data Unit, London (England).
ELASTIC STRESS CONCENTRATION FACTORS: GEOMETRIC DISCONTINUITIES IN FLAT BARS OR STRIPS OF ISOTROPIC MATERIALS
Aug. 1969 20 p refs Supersedes in part ESDU-65004 Sponsored by Roy. Aeron. Soc.
(ESDU-69020; ESDU-65004) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Data are presented on stress concentration effects that occur in flat bars or strips when they are loaded in tension or bending. A stress concentration factor is defined as the ratio of the highest stress to a reference stress calculable from simple theory. The data apply only to isotropic materials that obey Hooke's Law. However, most engineering materials conform substantially in these respects and for these the data may be used without significant error. The various geometries include cross sections with holes, slots, notches on one edge, and notches and fillets on both edges. Author

N72-33889 Engineering Sciences Data Unit, London (England).
STRESSES DUE TO INTERFERENCE-FIT PINS AND BUSHES IN PLATES, STRIPS OR LUGS
May 1971 12 p refs Supersedes in part ESDU-65004 Sponsored by Roy. Aeron. Soc. and Inst. of Mech. Engr.
(ESDU-71011; ESDU-65004) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Data are presented on the elastic stresses arising in flat plates, bars, strips, or lugs from the insertion of a circular interference fit pin or bush of similar or different material. The data are based upon two-dimensional analyses and therefore only give the average stress through the thickness of the plate or strip. The data apply strictly to isotropic materials that obey Hooke's law, but may be used without significant error for most engineering materials. Author

N72-33890 Engineering Sciences Data Unit, London (England).
ELASTIC STRESSES AND DEFLECTIONS FOR LONG RECTANGULAR PLATES WITH SMALL INITAL CURVATURE UNDER UNIFORMLY DISTRIBUTED NORMAL PRESSURE ON THE CONCAVE FACE
Aug. 1969 14 p ref Supersedes ESDU-Struct-02.09.13.14 Sponsored by Roy. Aeron. Soc.
(ESDU-69019; ESDU-Struct-02.09.13.14) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves are given which enable the maximum deflections and stresses to be determined for rectangular plates of uniform thickness, initially curved across the width, under uniformly distributed normal pressure on the concave face. The curves are derived for a pressure normal to the plane of the two edges but may be applied with sufficient accuracy to the case where the pressure is normal to the surface. The curves apply only to stresses within the elastic range of the material but are considered reasonably accurate beyond this provided the stresses do not exceed 0.2 percent proof stress. Author

N72-33891 Engineering Sciences Data Unit, London (England).
ELASTIC STRESSES AND DEFLECTIONS FOR FLAT SQUARE PLATES UNDER UNIFORMLY DISTRIBUTED NORMAL PRESSURE
Apr. 1970 14 p refs Supersedes ESDU-Struct-02.09.05 and in part ESDU-Struct-02.09.01, ESDU-Struct-02.09.02, ESDU-Struct-02.09.06, and ESDU-Struct-02.09.07 Sponsored by Roy. Aeron. Soc. and Inst. of Mech. Engr.
(ESDU-70001; ESDU-Struct-02.09.05; ESDU-Struct-02.09.01;

ESDU-Struct-02.09.02; ESDU-Struct-02.09.06; ESDU-Struct-02.09.07) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves are given which enable the stresses and deflection to be determined for initially flat square plates of uniform thickness under uniformly distributed normal pressure. The curves include those for the maximum total stress at the center, at the edge, and for the maximum values on the diagonals or center lines of the plate where these are greater. The corresponding middle surface stresses are also given. Author 13:C;

N72-33892 Engineering Sciences Data Unit, London (England).
DESIGN FOR MINIMUM WEIGHT COMPRESSION PANELS WITH UNFLANGED INTEGRAL STIFFENERS HAVING DIMENSIONAL RESTRICTIONS
Jul. 1970 28 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-70007) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A procedure is described to calculate the cross-sectional dimensions for minimum weight of uniform compression panels having unflanged integral stiffeners. A method is also given for determining the dimensions of the panel of least weight when one or more of the cross-sectional dimensions are fixed or restricted. An allowance is made for the effects of initial irregularities, and plasticity correction factors are included. Two examples are given which illustrate the application of the procedure. Author

N72-33893 Engineering Sciences Data Unit, London (England).
THE BUCKLING OF FLAT PLATES UNDER NON-UNIFORM COMPRESSION: SYMMETRIC DISTRIBUTIONS DUE TO INITIAL OR THERMAL STRESS
Jan. 1969 9 p Sponsored by Roy. Aeron. Soc.
(ESDU-69003) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A method is provided for checking the elastic stability of rectangular plates subject to stresses that are compressive at the center line and distributed parabolically across the width. The data are valid only for distributions, such as those arising from initial or thermal strain, which do not vary along the length of the plate. Author

N72-33894 Engineering Sciences Data Unit, London (England).
FLANGE EFFICIENCY FACTORS FOR CURVED BEAMS UNDER BENDING IN THE PLANE OF CURVATURE
Apr. 1971 16 p refs Sponsored by Roy. Aeron. Soc. and Inst. of Mech. Engr.
(ESDU-71004) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Data for the calculation of the elastic stresses in the flanges and the deflections of curved beams subjected to bending in the plane of curvature are presented. The data are provided in the form of flange efficiency factors from which equivalent flanges with various cross section areas may be obtained for use with beam theory. The data are based on the behavior of a complete ring subjected to pure bending. Author

N72-33895 Engineering Sciences Data Unit, London (England).
BUCKLING OF FLAT PLATES IN SHEAR
Jan. 1971 7 p refs Supersedes ESDU-Struct-02.03.01 Sponsored by Roy. Aeron. Soc.
(ESDU-71005; ESDU-Struct-02.03.01) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The buckling stress of flat isotropic plates loaded in uniform shear is given. The elastic buckling stress coefficient is plotted against the width/length ratio for six combinations of simply-supported and clamped edges. The plasticity reduction factor is also plotted against the ratio of the elastic shear stress at which the elastic plate would buckle to the stress at which tangent modulus equals 1/2 Young's modulus for various values of the material characteristics. Author

N72-33896 Engineering Sciences Data Unit, London (England).
ELASTIC DIRECT STRESSES AND DEFLECTIONS FOR FLAT RECTANGULAR PLATES UNDER UNIFORMLY DISTRIBUTED NORMAL PRESSURE
May 1971 20 p refs Sponsored by Roy. Aeron. Soc. and Inst. of Mech. Engr.
(ESDU-71013) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves are given for determining direct stresses and deflections for initially flat rectangular plates of uniform thickness and various length to width ratios under uniformly distributed normal pressure. Curves are given for the maximum deflection, the total stress at the center and at the edge, and for the maximum total stress on the diagonal where this may be greater. The middle surface stresses corresponding to the total stresses are also given. Author

N72-33897 Engineering Sciences Data Unit, London (England).
AVERAGE AND EDGE STRESSES FOR FLAT PLATES UNDER SHEAR AND COMPRESSION
Dec. 1970 3 p ref Sponsored by Roy. Aeron. Soc.
(ESDU-02.04.02) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves for finding the direct compressive loads a flat plate will support are presented. F.O.S.

N72-33898 Engineering Sciences Data Unit, London (England).
GENERALISED STRESS-STRAIN CURVES
Jan. 1971 4 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-00.02.04) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves and expressions are presented for determining the stress, and strain (expressed as the ratio of stress to secant modulus) of materials. F.O.S.

N72-33899 Engineering Sciences Data Unit, London (England).
THE CUMULATIVE DAMAGE OF ALUMINIUM ALLOY SPECIMENS UNDER VARIABLE AMPLITUDE FATIGUE LOADING
Oct. 1969 10 p Sponsored by Roy. Aeron. Soc.
(ESDU-69024) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Results of fatigue tests on aluminum alloy specimens are given in which the applied loads are selected to simulate aircraft gust and maneuver conditions. Specimens tested comprise complete wings and riveted sections having a range of K from 3.0 to 4.0 and notched bars and plates with a range K from 1.0 to 7.0. Load cycles determining fatigue damage are based on the combination of maximum peak and maximum trough proceeding through combinations successively smaller peaks and troughs to the minimum values of each. Author

N72-33900 Engineering Sciences Data Unit, London (England).
FORM FACTORS FOR CIRCULAR SECTIONS UNDER COMBINED BENDING AND AXIAL LOAD
May 1971 3 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-01.06.01) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Form factors for circular sections under combined bending and axial loads are discussed. The applications of numerical procedures for solving the bending moments and tensile end

load for a circular section tube are described. Mathematical models and graphs are included to amplify the theoretical considerations. P.N.F.

N72-33901 Engineering Sciences Data Unit, London (England).
FORM FACTORS FOR ANGLE, TEE AND CHANNEL SECTIONS UNDER COMBINED BENDING AND AXIAL LOAD
May 1971 4 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-01.06.03) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Data sheets are presented for finding the maximum bending moment and tensile end loads, when the end load acts in a direction to cause failure of angle, tee and channel beam sections. F.O.S.

N72-33902 Engineering Sciences Data Unit, London (England).
INTRODUCTION TO DESIGN INFORMATION ON ACOUSTIC FATIGUE
Jan. 1972 8 p refs Supersedes ESDU-66012 Sponsored by Roy. Aeron. Soc.
(ESDU-72001; ESDU-66012) Copyright. Avail. On subcription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The important factors affecting acoustic fatigue failure in aircraft structures are outlined. Data cover operating conditions, noise field characteristics, stress at critical points, and structural response. E.H.W.

N72-33903 Engineering Sciences Data Unit, London (England).
NATURAL FREQUENCIES OF BUILT-UP, FLAT, PERIODIC SKIN-STRINGER STRUCTURES. PART 1: STRINGERS RIGID IN BENDING
Jan. 1972 16 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-72003-Pt-1) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Information is presented to be used to predict the first two groups of natural frequencies of skin-stringer structures with four different end conditions. The results have been presented for varying degrees of stringer torsional stiffness, for three different aspect ratios, and for two different values of m, the number of half-waves across the frame pitch. Author

N72-33904 Engineering Sciences Data Unit, London (England).
NATURAL FREQUENCIES OF RECTANGULAR SINGLY-CURVED PLATES
Jan. 1972 24 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-72004) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The natural frequencies of plates with simply-supported and with fixed edges are expressed mathematically. Consideration is given to applications for aircraft structural panels. K.P.D.

N72-33905 Engineering Sciences Data Unit, London (England).
FORM FACTORS FOR FLANGED SECTIONS UNDER COMBINED BENDING AND AXIAL LOAD
May 1971 3 p refs
(ESDU-01.06.02) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London, W1R 7AD

Curves are presented for finding the value of maximum permissible bending moment appropriate to a given constant ratio of bending moment and axial load, An example illustrating the use of the charts is included. F.O.S.

N72-33906 Engineering Sciences Data Unit, London (England).
CRITERIA OF YIELDING AND FAILURE
Oct. 1970 3 p Sponsored by Roy. Aeron. Soc.
(RAS-02.00.00-Amend-A) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The magnitude of combined stresses which correspond to certain limiting states in the tension test are studied for predicting the behavior of materials under stresses more complex than uniaxial tension. The principal stress criterion is given for brittle materials. The maximum principal strain, maximum shear stress, maximum strain energy, and von Mises-Hencky criteria are considered for ductile materials. N.E.N.

N72-33907 Engineering Sciences Data Unit, London (England).
BENDING MOMENT AT CENTRE OF A STRUT DUE TO END LOADS AND END MOMENTS
Jan. 1971 3 p Sponsored by Roy. Aeron. Soc.
(ESDU-01.01.11) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The bending moment and maximum compression stress at the center of a strut due to end loads and end moments are plotted. E.H.W.

N72-33908 Engineering Sciences Data Unit, London (England).
INITIAL BUCKLING OF SLIGHTLY CURVED PLATES UNDER COMBINED LONGITUDINAL AND CIRCUMFERENTIAL DIRECT STRESS
Jan. 1971 7 p Sponsored by Roy. Aeron. Soc.
(ESDU-02.01.50) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The longitudinal stress at which a slightly curved plate, with simply supported edges, first buckles under uniform axial and circumferential stress is plotted. E.H.W.

N72-33909 Engineering Sciences Data Unit, London (England).
BUCKLING STRESS COEFFICIENTS FOR FLAT PLATES TAPERED IN PLAN, UNDER COMPRESSION
Jan. 1971 4 p ref Sponsored by Roy. Aeron. Soc.
(RAS-02.01.48) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Graphs are presented for determining the buckling stress coefficients for flat plates tapered symmetrically, when loaded by uniform compressive loads on the parallel ends. F.O.S.

N72-33910 Engineering Sciences Data Unit, London (England).
FLAT PANELS IN SHEAR Example on the Use of Data Sheets 02.03.01 to 02.03.09
Aug. 1966 2 p refs Sponsored by Roy. Aeron. Soc.
(ESDU-02.03.12-Amend-A) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The use of data sheets in the 02.03 series for the stress analysis of flat panels in shear is illustrated. A diagram of a typical panel and tables of dimensions, material properties, and applied loads are given. A routine procedure for determining the stresses in the various parts of the panel under the given loading conditions is set out. Author

N72-33911 Engineering Sciences Data Unit, London (England).
ELASTIC DIRECT STRESSES AND DEFLECTIONS FOR FLAT RECTANGULAR PLATES UNDER UNIFORMLY DISTRIBUTED NORMAL PRESSURE
May 1971 17 p refs Sponsored by Roy. Aeron. Soc. and Inst. of Mech. Engr.
(ESDU-71013) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves are given which enable the direct stresses and deflections to be determined for initially flat rectangular plates of uniform thickness and various length to width ratios under uniformly distributed normal pressure. Curves give the maximum

deflection, the total stress at the center and at the edge, and the maximum total stress on the diagonal. The curves are derived on the basis of thin plate theory. Author

N72-33912*# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
ON THE MODIFIED WESTERGAARD EQUATIONS FOR CERTAIN PLANE CRACK PROBLEMS
J. Eftis and H. Liebowitz [1972] 21 p refs
(Grant NGR-09-010-053)
(NASA-CR-112187) Avail: NTIS HC $3.25

An error in Westergaard's equation for a certain class of plane crack problems, originally pointed out by Sih, is briefly discussed. The source of the difficulty is traced to an oversight in an earlier work by MacGregor, upon whose work Westergaard based his equations. Several examples of interest illustrating the consequences of the necessary correction to these equations are given. Author

N72-33913*# Oklahoma State Univ., Stillwater.
A THEORETICAL ANALYSIS OF THE FREE VIBRATIONS OF RING- AND/OR STRINGER-STIFFENED ELLIPTICAL CYLINDERS WITH ARBITRARY END CONDITIONS. VOLUME 2: USERS MANUAL FOR COMPUTER PROGRAM
Donald E. Boyd, C. K. P. Pao, and Robert L. Brugh [1972] 100 p refs
(Grant NGR-37-002-089)
(NASA-CR-112174) Avail: NTIS HC $7.00 CSCL 20K

The computer program and user instructions are presented for the analysis of the natural frequencies and mode shapes of the cylinders. Sample input and output are included. Author

N72-33914*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN ELASTIC ANALYSIS OF STRESSES IN A UNIAXIALLY LOADED SHEET CONTAINING AN INTERFERENCE-FIT BOLT
John H. Crews, Jr. Washington Oct. 1972 28 p refs
(NASA-TN-D-6955; L-8415) Avail: NTIS HC $3.00 CSCL 20K

The stresses in a sheet with an interference-fit bolt have been calculated for two sheet-bolt interface conditions: a frictionless interface and a fixed (no-slip) interface. The stress distributions were calculated for various combinations of sheet and bolt moduli. The results show that for repeated loading the local stress range is significantly smaller if an interference bolt is used instead of a loosely fitting one. This reduction in local stress range is more pronounced when the ratio of bolt modulus to sheet modulus is large. The analysis also indicates that currently used standard values of interference cause yielding in the sheet. Author

N72-33915# Advisory Group for Aerospace Research and Development, Paris (France).
A COMPARISON OF METHODS USED IN FLUTTER RESEARCH
H. G. Kuessner (DEVLR, Goettingen, West Germany) Aug. 1972 141 p refs
(AGARD-R-592) Avail: NTIS HC $9.25 CSCL 01C

The eigenfrequencies, modes and generalized masses of the F104G aircraft have been calculated from the drawings by the finite-element method. The idealization of the structure by different types of elements and the formation of the corresponding mass matrix by adding lumped masses are described. The structure is divided into isolated substructures. By several condensation procedures the number of symmetric and antisymmetric unknowns has been reduced stepwise from 8250 + 7948 to 170 + 162. The rigid-body modes have been eliminated by 3 + 3 supports and by a modified mass matrix. The results of the calculation of 24 modes are described and illustrated. Only 13 of them were comparable with corresponding measurements of two independent ground vibration tests. Whereas the eigenfrequencies agree within a few percent, the mode shapes and the corresponding generalized masses show large differences and suggest the need for further improvements of the calculation method. Author

N72-33916*# Blume (John A.) and Associates Research Div., San Francisco, Calif.
STUDY AND EVALUATION OF FERRO-CEMENT FOR USE IN WIND TUNNEL CONSTRUCTION
Henry J. Larsen, Jr., comp. Jul. 1972 155 p refs
(Contract NAS2-5889)
(NASA-CR-114501; JABE-ARC-07) Avail: NTIS HC $9.75 CSCL 13C

The structural suitability and cost effectiveness of ferro-cement for large subsonic wind tunnel structures is investigated. This investigation was carried out in the following four main categories: (1) a state-of-the-art survey into the uses, properties, and costs of ferro-cement; (2) an evaluation of those ferro-cement properties critical to construction of large, subsonic wind tunnels, which have not been adequately established to date; (3) a laboratory testing program to determine preliminary values for those properties; and (4) a study to establish cost factors for ferro-cement as related to a preliminary construction scheme for a nacelle and shroud unit. Author

N72-33917*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
COMPUTER PROGRAM: JET 3 TO CALCULATE THE LARGE ELASTIC PLASTIC DYNAMICALLY INDUCED DEFORMATIONS OF FREE AND RESTRAINED, PARTIAL AND/OR COMPLETE STRUCTURAL RINGS
Richard W-H. Wu and Emmett A. Witmer Aug. 1972 261 p refs
(Grant NGR-22-009-339)
(NASA-CR-120993; ASRL-TR-154-7) Avail: NTIS HC $15.25 CSCL 20K

A user-oriented FORTRAN 4 computer program, called JET 3, is presented. The JET 3 program, which employs the spatial finite-element and timewise finite-difference method, can be used to predict the large two-dimensional elastic-plastic transient Kirchhoff-type deformations of a complete or partial structural ring, with various support conditions and restraints, subjected to a variety of initial velocity distributions and externally-applied transient forcing functions. The geometric shapes of the structural ring can be circular or arbitrarily curved and with variable thickness. Strain-hardening and strain-rate effects of the material are taken into account. Author

N72-33918# Lockheed Missiles and Space Co., Palo Alto, Calif.
LOW-FREQUENCY WAVE STRAIN PROCESS IN A SEMI-INFINITE CYLINDRICAL SHELL SUBMERGED IN A COMPRESSIBLE FLUID
M. V. Aizenberg 1972 8 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Tverd. Tela (Moscow), no. 3, 1972 p 99-104
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Numerical computations are presented on longitudinal low frequency elastic waves in a semi-infinite cylindrical shell. The shell is bounded by a rigid diaphragm and subjected to acoustic pressure waves being propagated in an axial direction. Author

N72-33919# Lockheed Missiles and Space Co., Palo Alto, Calif.
INFLUENCE OF FLUID INHOMOGENEITY ON THE VIBRATIONS OF A THIN ELASTIC PLATE
A. E. Bukatov and L. V. Cherkesov 1972 7 p refs Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 8, no. 6, 1972 p 111-117
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

A thin elastic isotropic plate is considered to float on the surface of an ideal incompressible fluid whose density in the unperturbed state is a continuous function of the depth. The plate and fluid are infinite in the horizontal directions, while the

fluid depth is finite. The influence of fluid inhomogeneity on the plate vibrations generated by periodic normal stresses is investigated. The problem is formulated mathematically, and the solution is found. The results of a study of the influence of the plate characteristics and fluid inhomogeneity on the distribution of the vertical fluid velocity component over the depth are also given. Author

N72-33920# Lockheed Missiles and Space Co., Palo Alto, Calif.
LONGITUDINAL COMPRESSION OF A SANDWICH PLATE WITH INITIAL DEFLECTION AND PHYSICAL NONLINEARITY OF THE MIDDLE LAYER (FILLER)
I. V. Dautov 1972 3 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Aviats. Tekh. (Kazan), no. 2, 1972 p 164-166
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The longitudinal compression of a rectangular sandwich plate with light filler, subject to a nonlinear law of elasticity, is expressed mathematically, and the system is solved by successive approximations. The material of the outer layers is assumed to be physically linear, and the filler works by shear. The natural flexural stiffness of the outer layers is assumed to be neglegible compared to the total stiffness of the sandwich. The special case of the square plate is also considered. N.E.N.

N72-33921*# Grumman Aerospace Corp., Bethpage, N.Y.
THERMAL DYNAMIC MODELING STUDY
I. U. Ojalvo Washington NASA Oct. 1972 73 p refs
(Contract NAS1-10635-3)
(NASA-CR-2125) Avail: NTIS HC $3.00 CSCL 20K

Some thermal dynamic requirements associated with the space shuttle vehicle are reviewed. Pertinent scaling laws are discussed and recommendations are offered regarding the need for conducting reduced-scale dynamic tests of major components at elevated temperatures. Items considered are the development and interpretation of thermal dynamic structural scaling laws, the identification of major related problem areas and a presentation of viable model fabrication, instrumentation, and test procedures. Author

N72-33922# Laboratorium fur Betriebsfestigkeit, Darmstadt (West Germany).
THE FATIGUE LIFE OF SAFE LIFE STRUCTURES. AN AUSTRALIAN APPROACH
F. H. Hooke, (Aeron. Res. Labs., Melbourne) 1972 49 p
(TR-98) Avail: NTIS HC $4.50

The principles adopted in Australia to assess the fatigue life of safe life structures in aircraft design so that a comparison may be made with procedures followed in Germany is presented. Simplified assessment procedures are outlined including considerations of the degree of similarity between test and service for both loading and specimen configuration. Several methods used to relate the fatigue scatter factor to failure probability are shown which take into account number of test data, variability in loading spectra, bias, and number of critical points. Furthermore the application of reliability theory is demonstrated involving variability of crack length and extreme loads. Author (ESRO)

N72-33923# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
ON THE TRANSITION FROM AXISYMMETRIC TO MULTILOBED CREEP BUCKLING
Nicholas J. Hoff Oct. 1971 19 p refs
(Contract N00014-67-A-0112-0003; NR Proj. 064-425)
(AD-744668; SUDAAR-434; TR-23) Avail: NTIS CSCL 20/11

Initial axisymmetric deviations from the exact circular cylindrical shape increase with time in consequence of creep when a uniformly distributed axial compressive load is acting on a thin-walled cylindrical shell. The increasing deformations are accompanied by the development of hoop stresses. When the hoop compression reaches a sufficiently high value, the shell can buckle elastically in agreement with Koiter's special theory. Author (GRA)

N72-33924# Lehigh Univ., Bethlehem, Pa. Inst. of Fracture and Solid Mechanics.
RUNNING CRACK IN AN INCIDENT WAVE FIELD
E. P. Chen and G. C. Sih May 1972 67 p refs
(Contract N00014-68-A-0514)
(AD-743507; IFSM-72-17; TR-72-2-ONR) Avail: NTIS CSCL 20/11

Steady-state diffraction of stress waves by a semi-infinite running crack is considered in this study. In conjunction with the principle of superposition, an exact solution is obtained by using a method based on the Wiener-Hopf technique. As in the static case, the dynamic stresses possess the familiar inverse square-root singularity at the crack tip. The stress-intensity factors, however, are found to depend on the incident wave length, angle of incidence, Poisson's ratio of the elastic solid and speed of crack propagation. The stress-intensity factor serves as a useful parameter in studying elasto-dynamic crack problems since it can be associated with the rate at which elastic and kinetic energies are released by the crack. Ductile fracture is studied by adapting the Dugdale's hypothesis. The length of the plastic zone is determined and the influence of the speed of crack propagation is displayed graphically. Author (GRA)

N72-33925# Iowa Univ., Iowa City.
INVESTIGATION OF AN UNBONDED CONTACT PROBLEM
D. P. Singh and Kwan Rim Jun. 1972 52 p refs
(Contract DAAF03-69-C-0014; Proj. Themis)
(AD-743499; THEMIS-UI-42) Avail: NTIS CSCL 13/13

The problem of an unbonded contact between a thick beam and a semi-infinite plate is investigated. It is an extension of Yoon's previous work in which he successfully applied an optimization technique to find the contact length and the distribution of the contact stress of the same problem, but he did not take into account the effect of Poisson's ratio and the span/height ratio of the beam. In the present work, the effect of the two parameters on the contact length and the contact stress is carefully investigated using a thick beam theory. The results of the refined analysis indicate that, although the contact length is virtually unaffected by the use of the thick beam theory, there is a significant change in the distribution of the contact stresses as compared to Yoon's results. As it has been observed by the previous investigators, the contact length is found to remain independent of the magnitude of the load applied on the beam. Author (GRA)

N72-33926# Polytechnic Inst. of Brooklyn, N.Y. Dept. of Aerospace Engineering and Applied Mechanics.
FREE VIBRATIONS OF RING STIFFENED TOROIDAL SHELLS. PART 1: ANALYTICAL FORMULATION
Theodore Balderes and Anthony E. Armenakas Apr. 1972 149 p refs
(Contract F44620-69-C-0072; AF Proj. 9782)
(AD-743306; PIBAL-72-12; AFOSR-72-0815TR) Avail: NTIS CSCL 20/11

The free vibrations of ring stiffened toroidal shells are studied. Stiffening rings are assumed placed at meridional sections, and treated as discrete members. An arbitrary number of rings differing in properties and unequally spaced is considered. The shell segments, are coupled to the stiffeners by imposing compatibility at the junctions. The Love-Reissner shell theory is employed for analyzing the torus segments. The shell equations are first converted into a set of eight partial differential equations with variable coefficients, expressing first derivatives, in the circumferential direction, of the eight shell functions which appear in the natural boundary conditions at a meridional section. The shell functions are subsequently expanded into a Fourier series in the meridional coordinate and substituted in the aforementioned eight equations which are then transformed with the aid of some trigonometric identities, into two uncoupled infinite sets of ordinary differential equations. Author (GRA)

N72-33927# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLVING PROBLEMS ABOUT THE AXIALLY SYMMETRIC DEFORMATION OF MULTILAYER SHELLS OF REVOLUTION, TAKING TRANSVERSE SHEAR INTO ACCOUNT
V. G. Karnaukhov, A. A. Kilchinskii, and A. D. Kovalenko 24 Mar. 1972 11 p refs Transl. into ENGLISH from "7th Vsesoyuznoi Konf. po Teorii Obolochek i Plastinok, Dnypropetroysk, 1969, Tr." Moscow, Nauka Publ. House, 1970 p 271-276
(AD-743332; FTD-HC-23-1801-71) Avail: NTIS CSCL 13/13

The authors derive the basic system of equations for the investigation of the stress-deformed state of multilayer shells, while taking into account the increased pliability of the material of the layers when subjected to transverse shears. They construct precise analytical solutions, which are special (hypergeometric) functions, of problems about the axially symmetric deformation of conical and spherical shells. The solutions are generalized for the case where the material of the layers possesses rheonomic properties. Author (GRA)

N72-33928# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORY OF SHELLS OF REVOLUTION WITH MERIDIONAL RIBBING
B. I. Grigolyuk and V. M. Tolkachev 24 Mar. 1972 10 p refs Transl. into ENGLISH from "7th Vsesoyuznoi Konf. po Teorii Obolochek i Plastinok, Dnepropetrousk, 1969, Tr." Moscow, Nauka Publ. House, 1970 p 201-204
(AD-743331; FTD-HC-23-1800-71) Avail: NTIS CSCL 13/13

The authors derive the integral equations for determining the reactions affecting a shell from the ribbing side. They analyze the equations and peculiarities in the area of the ribs' end. Author (GRA)

N72-33929# California Univ., Berkeley. Div. of Applied Mechanics.
RATE-TYPE CONSTITUTIVE EQUATIONS AND ELASTIC-PLASTIC MATERIALS
A. E. Green and P. M. Naghdi May 1972 26 p refs
(Contract N00014-69-A-0200-1008; NR Proj. 064-436)
(AD-745290; AM-72-1) Avail: NTIS CSCL 20/11

The paper is concerned with a class of rate-type constitutive equations, which characterize the behavior of elastic-plastic solids under large deformation. The theory is developed without a priori introduction of the concept of plastic strain and involves only the stress and the total strain as basic ingredients, apart from the thermodynamic variables. The relationship between the results obtained here and those of a more familiar form of a theory of elastic-plastic solids is indicated. Author (GRA)

N72-33930# Alabama Univ., Huntsville. Research Inst.
VARIATIONAL PRINCIPLES IN NONLINEAR CONTINUUM MECHANICS
J. T. Oden Apr. 1972 29 p refs
(Contract F44620-69-C-0124; AF Proj. 9560)
(AD-743320; UARI-RR-120; AFOSR-72-0817TR) Avail: NTIS CSCL 20/11

The paper deals with general variational principles for a wide class of nonlinear problems in continuum mechanics and thermodynamics. By a variational principle is meant a theorem concerning stationary values of a well-defined functional, as distinct from Galerkin integrals or virtual work principles associated with a given physical law. The essential features of a general theory of potential operators on Banach spaces and the field equations governing the thermodynamics of continua are first reviewed. Then a functional K(lambda) is generated which assumes a stationary value when the entire collection of field equations governing the behavior of the continuum are satisfied. Author (GRA)

N72-33931# Martin Marietta Corp., Denver, Colo.
EFFECT OF VACUUM ENVIRONMENT ON MECHANICAL BEHAVIOR Annual Report
Irvin R. Kramer and A. Kumar Feb. 1972 33 p refs
(Contract F44620-69-C-0065; AF Proj. 9768)
(AD-743321; MCR-72-64; AFOSR-72-0734TR) Avail: NTIS CSCL 20/11

The effect of vacuum environment on the rate of crack propagation of aluminum 2014-T6 and 4130 steel was investigated under plane strain conditions. Compact tension specimens were used which were pin loaded. Center notched specimens of titanium (6Al-4v) were used for crack propagation and crack growth measurements under plane stress conditions in methanol-chloride environment. It is shown that surface layer contributes to increased rate of crack propagation. A reduction in surface layer stress brought about by vacuum environment or by prestress and surface layer removal treatment decreases the rate of crack propagation. Author (GRA)

N72-33932# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROPAGATION OF A PLANE WAVE IN AN ANISOTROPIC SANDWICH PLATE
P. F. Sabodash and I. G. Filippov 24 Mar. 1972 8 p ref Transl. into ENGLISH from "Trudy Vseoyuznoi Konferentsii po teorii obolochek i Plastinok (7th) Dnepropetrovsk, 1969" Moscow, 1970 p 684-686
(AD-743334; FTD-HC-23-1803-71) Avail: NTIS CSCL 13/13

The article solves the dynamic problem of impact on the end face plane of an anisotropic, semi-infinite sandwich plate, assuming that the material in the plate's middle layer has a higher wave propagation speed than the materials in the two outer layers. Author (GRA)

N72-33933# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON LOSS OF STABILITY OF A CYLINDRICAL SHELL UNDER EXTERNAL STRESS AND TORSION
V. V. Mikhailov 29 Mar. 1972 8 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukr. SSR (Kiev), no. 1, 1970 p 51-53
(AD-743335; FTD-HC-23-32-72) Avail: NTIS CSCL 13/13

A cylindrical shell, hinge-supported along its edge of radius, length, thickness, which is being acted on by uniform external pressure and twisting force is examined. The quantity is assumed small and fixed. Author (GRA)

N72-33934# Stanford Univ., Calif. Dept. of Applied Mechanics.
DYNAMIC BEHAVIOR AND STABILITY OF SOLIDS AND STRUCTURES Interim Scientific Report
George Herrmann 31 Mar. 1972 9 p
(Grant AF-AFOSR-1905-70; AF Proj. 9782)
(AD-745140; AFOSR-72-1108TR) Avail: NTIS CSCL 13/13

The report is a compilation of abstracts of articles relative to research performed on the dynamic response of structural shells. GRA

N72-33935# Catholic Univ. of America, Washington, D.C. Dept. of Civil and Mechanical Engineering.
A NOTE ON BUCKLING OF SPHERICAL CAPS WITH INITIAL ASYMMETRIC IMPERFECTIONS
Robert Kao Dec. 1971 19 p refs
(Grant NSF GK-23747)
(PB-209624; CATHU-CME-NSF-71-01) Avail: NTIS HC $3.00 CSCL 20K

A formulation for spherical cap strain-displacement relations including initial imperfections is adopted which is based on Donnell-type nonlinear cylindrical shell theory. A series of runs was made to determine the asymmetric buckling pressures for the spherical caps with 90 deg pieshaped imperfection segments. Results obtained for deflection response values of 6 and 8 are indeed lower than those obtained previously. Author (GRA)

N72-33936# California Univ., Berkeley. Div. of Structural Engineering and Structural Mechanics.
ON SOME NUMERICAL METHODS IN CONTINUUM MECHANICS
Paul D. Smith Nov. 1971 119 p refs
(PB-210380; UCSESM-71-21) Avail: NTIS HC $3.00 CSCL 20K

The numerical solution of some initial-value problems in continuum mechanics is considered. Namely, continuum problems with differential equations of symmetric-hyperbolic-type, which include wave propagation in linear elastic solids, beams and fluids, are studied using a mixed velocity-stress formulation. Lax-Vendroff solution schemes are employed to obtain numerical solutions to linear elastic problems. Implicit methods based on semi-group theory are also formulated and numerical results are presented for some two-dimensional elasticity problems.
Author (GRA)

N72-33937# California Univ., Berkeley. Structural Engineering Lab.
SOLID SAP: A STATIC ANALYSIS PROGRAM FOR THREE DIMENSIONAL SOLID STRUCTURES
Edward L. Wilson Mar. 1972 170 p refs
(Contract HO-110231)
(PB-209949; UCSESM-71-19; OFR-15-72) Avail: NTIS HC $3.00 CSCL 13M

The report describes a general computer program for the linear elastic static analysis of complex structural systems. These elements have special advantages for the analysis of massive underground structures such as mine structures and aboveground structures such as arch dams. The report covers the following element types: three dimensional truss; three dimensional beam; plane stress and plane strain; two dimensional axisymmetric solid; three dimensional solid; plate and shell; boundary; and thick shell elements. New finite elements were developed that are useful in the analysis of two- and three-dimensional solids. Examples are given that illustrate the accuracy of the elements. A description on the use of the program and a FORTRAN 4 listing are given.
Author (GRA)

N72-33967 National Aeronautical Establishment, Ottawa (Ontario). Low Speed Aerodynamics Lab.
SOME APPROACHES FOR IMPROVING THE AERODYNAMIC STABILITY OF BRIDGE ROAD DECKS
R. L. Wardlaw *In* NRC of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 33-42 refs (For availability see N72-33964 24-34)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N72-33938 Engineering Sciences Data Unit, London (England).
EFFECTS OF KINETIC HEATING ON EQUILIBRIUM TEMPERATURE OF FLIGHT VEHICLES
Oct. 1969 13 p refs Supersedes ESDU-Aero-S.00.03.20 Sponsored by Roy. Aeron. Soc.
(ESDU-69012; ESDU-Aero-S.00.03.20) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Data are presented for estimating the equilibrium temperature distribution on flat plates, wedges, cylinders, and cones in constant velocity flight in air. The equilibrium temperature is attained when the effects of forced convection heat transfer and solar radiation to the surface are balanced by the difference between radiation from the surface and atmospheric radiation to the surface. The heat balance equations and their solutions are described, and an example is given to illustrate the method of solution. Tables are included which list the normal total emissivities and solar absorptivities of various surfaces.
D.L.G.

N72-33939 Engineering Sciences Data Unit, London (England).
HEAT TRANSFER BY FORCED CONVECTION BETWEEN A TWO-DIMENSIONAL LAMINAR BOUNDARY LAYER AND A SMOOTH FLAT PLATE, WITH APPLICATION TO WEDGES, CYLINDERS AND CONES
Jun. 1969 13 p refs Supersedes ESDU-Aero-S.00.03.19 Sponsored by Roy. Aeron. Soc.
(ESDU-69010; ESDU-Aero-S.00.03.19) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Numerical procedures for determining the heat transfer by forced convection between a two-dimensional laminar boundary layer and a smooth flat plate are presented. The conditions considered are: (1) flat plate flow, (2) supersonic wedge flow, (3) parallel circular cylinder axisymmetric flow, and (4) right circular cone in supersonic flow under axisymmetric flow conditions. Mathematical models and graphs are included.
Author

N72-33940 Engineering Sciences Data Unit, London (England).
HEAT TRANSFER BY FORCED CONVECTION BETWEEN A TWO-DIMENSIONAL TURBULENT BOUNDARY LAYER AND A SMOOTH FLAT PLATE, WITH APPLICATION TO WEDGES, CYLINDERS AND CONES
Jun. 1969 17 p refs Supersedes ESDU-Aero-S.00.03.19 Sponsored by Roy. Aeron. Soc.
(ESDU-69011; ESDU-Aero-S.00.03.19) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Numerical procedures for determining the heat transfer by forced convection between a two dimensional turbulent boundary layer and a smooth flat plate are presented. The conditions considered are: (1) flat plate flow, (2) supersonic wedge flow, (3) parallel circular cylinder axisymmetric flow, and (4) right circular cone in supersonic flow under axisymmetric conditions. Mathematical models and graphs are included.
Author

N72-33941 Engineering Sciences Data Unit, London (England).
BENDING MOMENT AT CENTRE OF A STRUT DUE TO END LOADS AND UNIFORMLY DISTRIBUTED SIDE LOAD
May 1971 3 p Sponsored by Roy. Aeron. Soc.
(ESDU-01.01.13) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A procedure for calculating the bending moment at the center of a strut due to end loads and uniformly distributed side load is presented. The strut is considered as bending in one plane only under the combined action of the end loads, uniformly distributed side load, and equal end restraining moments all acting in the plane of bending. The flexural stiffness of the strut is assumed uniform along the strut length and constant during the process of deflection. A mathematical model and a graph are included to amplify the theoretical considerations.
Author

N72-33942 Engineering Sciences Data Unit, London (England).
THERMAL STRESSES IN UNRESTRAINED PLATES SUBJECTED TO A RECOVERY TEMPERATURE VARYING LINEARLY WITH TIME
Jan. 1971 4 p ref Sponsored by Roy. Aeron. Soc.
(ESDU-H.02.00.04) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves are presented which show the variation with time of the thermal stresses at the surfaces of a thermally thick unrestrained plate which is heated on one surface, the other surface being insulated. The heated surface is subjected to a recovery temperature which varies linearly with time. The curves are plotted for various values of the Biot number.
Author

N72-33943 Engineering Sciences Data Unit, London (England).
TEMPERATURES IN PLATES SUBJECTED TO A RECOVERY TEMPERATURE VARYING LINEARLY WITH TIME
Jan. 1971 5 p ref Sponsored by Roy. Aeron. Soc.
(ESDU-H.02.00.01) Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

Curves are presented which show the variation with time of the temperature change at the heated and insulated surfaces of a thermally thick plate and at three planes at equal intervals of 1/4 the thickness across the plate. The heated surface is subjected to a recovery temperature which varies linearly with time. The curves are plotted for various values of the Biot number. Author

N72-33944*# Aerojet Liquid Rocket Co., Sacramento, Calif. Engine Components Dept.
HEAT PIPE TECHNOLOGY FOR ADVANCED ROCKET THRUST CHAMBERS Final Report, 1 Jul. 1970 - 31 Jul. 1971
D. C. Rousar 15 Sep. 1971 224 p refs Prepared for JPL (Contract NAS7-697)
(NASA-CR-128320; Rept-697-F) Avail: NTIS HC $13.25 CSCL 20M

The application of heat pipe technology to the design of rocket engine thrust chambers is discussed. Subjects presented are: (1) evaporator wick development, (2) specific heat pipe designs and test results, (3) injector design, fabrication, and cold flow testing, and (4) preliminary thrust chamber design. Author

N72-33945*# Geoscience, Ltd., Solana Beach, Calif.
LIQUID METAL BOILING INCEPTION
C. M. Sabin, H. F. Poppendiek, G. Mouritzen, P. T. Meckel, and J. E. Cloakey Washington NASA Aug. 1972 153 p refs (Contract NAS3-13462)
(NASA-CR-2095; GLR-94) Avail: NTIS HC $3.00 CSCL 20M

An experimental study of the inception of boiling in potassium in forced convection is reported. The boiler consisted of a 0.19-inch inside diameter, niobium-1% zirconium boiler tube approximately six feet long. Heating was accomplished by direct electrical tube wall conduction. Experiments were performed with both all-liquid fill and two-phase fill startup sequences and with a range of flow rates, saturation temperatures, inert gas levels, and fill liquid temperatures. Superheat of the liquid above the equilibrium saturation temperature was observed in all the experiments. Incipient boiling liquid superheat ranged from a few degrees to several hundred. Comparisons of these data with other data and with several analytical treatments are presented. Author

N72-33946*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FLIGHT AND GROUND TESTS OF A VERY LOW DENSITY ELASTOMERIC ABLATIVE MATERIAL
George C. Olsen and Andrew J. Chapman, III Washington Nov. 1972 32 p refs
(NASA-TN-D-6956; L-8412) Avail: NTIS HC $3.00 CSCL 20M

A very low density ablative material, a silicone-phenolic composite, was flight tested on a recoverable spacecraft launched by a Pacemaker vehicle system; and, in addition, it was tested in an arc heated wind tunnel at three conditions which encompassed most of the reentry heating conditions of the flight tests. The material was composed, by weight, of 71 percent phenolic spheres, 22.8 percent silicone resin, 2.2 percent catalyst, and 4 percent silica fibers. The tests were conducted to evaluate the ablator performance in both arc tunnel and flight tests and to determine the predictability of the albator performance by using computed results from an existing one-dimensional numerical analysis. The flight tested ablator experienced only moderate surface recession and retained a smooth surface except for isolated areas where the char was completely removed, probably following reentry and prior to or during recovery. Analytical results show good agreement between arc tunnel and flight test results. The thermophysical properties used in the analysis are tabulated. Author

N72-33947# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
METHODS FOR EVALUATING EXPLOSIVES AND HAZARDOUS MATERIALS
C. M. Mason and E. G. Aiken 1972 53 p refs
(BM-IC-8541) Avail: SOD $0.55 as I 28.27:8541

The methods currently used by the Bureau of Mines to evaluate the sensitivity, strength, incendivity, gaseous products, and physical properties of explosives and hazardous chemicals are described. The tests used to evaluate explosives which are certified as permissible for use in underground coal mines are included. Author

N72-33948# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE INFLUENCE OF THE RATE OF PULSED HEATING OF A ROD ON THE MAGNITUDE OF THE THERMOELASTIC STRESSES
V. M. KulGavchuk and A. A. Uchaev 1972 6 p refs Transl. into ENGLISH from Prikl. Mekh. (Kiev), v. 8, no. 6, 1972 p 90-95
Avail: NTIS HC $3.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The magnitude is investigated of the thermoelastic stresses in a rod (fixed at one end and with a load at the free end) heated by a high density current pulse. Starting with the definition of the ratio between the load mass and mass of the rod, and considering discharge modes due to thermal impact, it is shown that the displacement of the end of the rod depends on the ratio between the heating time constant and the period of natural vibrations. F.O.S.

N72-33949# Los Alamos Scientific Lab., N.Mex.
MEASUREMENTS OF CONVECTIVE HEAT-TRANSFER COEFFICIENTS FOR THE SUBSONIC FLOW OF HYDROGEN AND HELIUM IN SMOOTH TUBES AT MODERATE SURFACE AND FLUID TEMPERATURES
J. A. Sullivan and C. R. King Mar. 1972 14 p refs
(Contract W-7405-eng-36)
(LA-4882) Avail: NTIS

Experimental investigations into forced convection heat transfer for helium and hydrogen flowing in smooth tubes were conducted at a nominal inlet temperature of 300 K, wall temperatures to 1475 K, exit gas temperatures to 725 K, inlet Reynolds numbers from 10,000 to 70,000 and heat fluxes to 31.4 cal/sec sq cm. The length-to-diameter ratio of the test section was 87, and maximum wall-to-bulk temperature ratios in the experiments reached 1.9. The results agree well with a recently published correlation of experimental data, but preliminary comparisons of these data with a two-dimensional numerical solution for turbulent flow in a heated tube show only moderate agreement. Author (NSA)

N72-33950# Technische Univ., Berlin (West Germany). Sonderforschungsbereich Magnetohydrodynamik.
THEORETICAL INVESTIGATION OF THE TEMPERATURE DISTRIBUTION IN A Na-K COUNTERFLOW HEAT EXCHANGER WITH LIQUID REVERSING [THEORETISCHE UNTERSUCHUNG DER TEMPERATUR-VERTEILUNG IN EINEM Na-K-GEGENSTROM-WAERMETAUSCHER MIT FLUESSIGKEITSUMKEHR]
S. Meier Feb. 1971 62 p refs In GERMAN; ENGLISH summary
(SFB-MHD-3) Avail: NTIS HC $5.25

An ALGOL program was written to calculate the distribution of temperature in a Na-K counterflow heat exchanger with reversed flow, to be used as an MHD heat source. The program includes the dependency of physical properties and heat transfer coefficient on temperature. Inlet temperature of potassium and

flow rate of sodium were varied widely. The results indicate agreement between the calculated performance and the requirement for heat power of 0.5 MW. Nevertheless, it is proposed to reduce the sodium flow rate from 130 g/s to 85 g/s in order to remain within the limits of the indicated material strength values. Author (ESRO)

N72-33951# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE KINETICS OF THE VAPORIZATION AND BURNING OF CONDENSED HYDROCARBON FUELS
D. I. Polishchuk, V. L. Yankevich, and I. N. Nechitailo 27 Mar. 1972 11 p refs Transl. into ENGLISH from Fiz. Aerodispersnykh Sistem (USSR), no. 2, 1970 p 111-116
(AD-743673; FTD-MT-24-2045-71) Avail: NTIS CSCL 21/2

An experimental study of the vaporization and combustion to single drops of kerosene and gasoline thickened with polyisobutylene is given. The drops were suspended at the outlet of the tube in which the flow was produced. The temperature was varied from 300 to 800 C, while the flow was equal to 3 m per sec. It was established that pulsations arise during vaporization and combustion. Brief periods of uniform combustion alternate with more or less intense flame bursts. The time required for complete vaporization of drops of various diameters was determined, as well as the ignition delay time and the minimum ignition temperature. Author (GRA)

N72-33952# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
HEAT TRANSFER RESEARCH Final Report, Jul. 1965 - Jan. 1972
Max G. Scherberg May 1972 29 p refs
(AD-744830; ARL-72-0075) Avail: NTIS CSCL 20/4

The specific objective of the program was to provide improved information on selected heat transfer processes along external or internal surfaces of high speed modern aircraft. The goal was to reduce empirical methods and enhance understanding of the processes so that needed design requirements calling for either reduced or increased heat transfer could be implemented. Three task areas were investigated. Author (GRA)

N72-33953# Boston Coll., Chestnut Hill, Mass. Dept. of Chemistry.
STRUCTURE OF FLUORINE SUPPORTED FLAMES. 2: CONCENTRATION PROFILES FOR FLAMES OF THE SYSTEMS: H2-F2, H2-F2-NH3, NH3-F2, C2H2-F2 AND C2H4-F2
Allen Hoffman, Klaus H. Homann, and Donald I. Maclean May 1972 34 p refs
(Contract N00014-69-A-0453; NR Proj. 092-536)
(AD-743501; FRK-117) Avail: NTIS CSCL 21/2

Knowledge of combustion processes in flames with halogens as oxidation partners is very sparse. Thus the concentration profiles of reactants, stable products and reactive intermediates have been measured in low pressure flames of the following systems burning on a multi-diffusion burner. H2-F2; H2-F2-NH3; C2H2-F2; and C2H4-F2. GRA

N72-33954# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HEAT TRANSFER COEFFICIENTS FOR TWO-PHASE (WATER/AIR) FLOW OVER A TUBE BANK M.S. Thesis
Raymond A. Carpenter Jun. 1972 74 p refs
(AD-744816; GNE/PH/72-2) Avail: NTIS CSCL 14/2

Local heat and mass transfer coefficients for spray flow over a heated tube bank were determined for a range of mass flux ratios and spray-water injection temperatures. Reynolds numbers were based on the minimum flow area within the tube bank and the tube outer diameter. The components of the overall heat transfer coefficient are reported for each case investigated. A total heat transfer coefficient and heat transfer amplification factor are defined and reported as functions of mass flux ratio. Author (GRA)

N72-33955# California Univ., Los Angeles. Dept. of Physics.
HYPERSONIC ATTENUATION IN THE VICINITY OF THE SUPERFLUID TRANSITION OF LIQUID HELIUM
Daniel E. Commins Jun. 1972 93 p refs
(Contract N00014-69-A-0200-4014; NR Proj. 384-302)
(AD-744710; TR-34) Avail: NTIS CSCL 20/13

The relative ultrasonic attenuation in liquid helium at 1 GHz has been measured in critical region with a fixed path interferometer. The sample was isolated from the main bath by a vacuum and the amplitude of the transmitted sound wave was measured while the temperature of the sample was made to drift at rates as slow as 3 x 10 to the minus 6th power K/sec. The attenuation is found to have a very large non-singular peak of about 2500/cm with its maximum at 3.26 plus or minus 0.20 mK below the lambda point. After the contribution of viscous and thermal losses to the attenuation has been subtracted, the temperature dependence of the critical attenuation is found to vary approximately as 1/the square root of (T(p)- T) on both sides of T(p), the temperature of the peak. The attenuation peak cannot be explained by the Landau-Khalatnikov theory, and processes other than the decay of first into second sound must be considered. These results are in substantial agreement with earlier results but locate the peak with much greater reliability. Author (GRA)

N72-33956# Acurex Corp., Mountain View, Calif. Aerotherm Div.
AEROTHERM AXI-SYMMETRIC TRANSIENT HEATING AND MATERIAL ABLATION COMPUTER PROGRAM (ASTHMA 3). VOLUME 1: PROGRAM DESCRIPTION AND SAMPLE PROBLEMS
Jan. 1972 103 p refs
(Contract F04611-69-C-0081)
(AD-744853; Aerotherm-UM-72-26-Vol-1;
AFRPL-TR-72-24-Vol-1) Avail: NTIS CSCL 20/13

The document presents a user's manual for the Aerotherm Axi-Symmetric Transient Heating and Material Ablation Program, Version 3 (ASTHMA 3), including a general description of program capabilities and solution procedures as well as a detailed set of input instructions. ASTHMA 3 is a transient heat conduction program for two-dimensional, axi-symmetric bodies. Multiple non-charring, anisotropic materials may be studied. The surface boundary condition has three options, including an unusually general thermochemical erosion or ablation condition as well as simplified radiation and specified temperature options. Author (GRA)

N72-33957# Picatinny Arsenal, Dover, N.J.
A FLUID-MECHANICAL FORMULATION OF THE PROBLEM OF THERMOMECHANICAL INSTABILITY IN ENERGETIC MEDIA
Frank Crowne and Paul Harris Mar. 1972 56 p refs
(AD-745093; PA-TR-4373) Avail: NTIS CSCL 19/1

Thermomechanical instabilities in reactive media are examined first from a thermodynamic viewpoint, where certain ranges of temperature, pressure or density are considered unstable which can be arrived at from the second law of thermodynamics and assumptions about the way heat is released into the fluid. It is then shown that this criterion for instability can be derived from the hydrodynamic equations, and that a substance which satisfies the criterion will amplify a sound wave as the sound wave propagates through the substance. Author (GRA)

N72-33958# Naval Postgraduate School, Monterey, Calif.
CONJUGATED TRANSIENT HEAT TRANSFER IN PIPE FLOW M.S. Thesis
Abdollah Zargary Jun. 1972 159 p refs
(AD-745141) Avail: NTIS CSCL 20/4

Transient temperature distribution in axisymmetric systems of incompressible fluid flow through semi-infinite, externally insulated cylindrical pipes is considered under the assumption of constant uniform velocity and constant material properties. The

general problem, including all significant heat transfer mechanisms, except radiation, is reduced to an integral equation containing only one unknown function, namely an interface temperature as a function of time and axial position. By neglecting one or more heat transfer mechanisms, several other formulations are obtained. These are analyzed so as to provide approximate and closed form solutions not previously available. Similar formulations and results are obtained for the case of fluid between parallel plates.
Author (GRA)

N72-33959# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF TANGENTIAL GAS VELOCITY ON COMBUSTION INSTABILITY IN A LIQUID-GAS COMBUSTOR M.S. Thesis
Donald William Avery, Jr. Dec. 1971 84 p refs
(AD-745183) Avail: NTIS CSCL 21/8

A small, uncooled liquid rocket motor was utilized to examine the effects of the magnitude and direction of a steady vortex velocity on combustion instability. The rocket operated on normal heptane and air, with air flow rates controllable to allow for various amounts of tangential momentum. Results of the investigation indicated that an energy feedback mechanism, through tangential momentum, did exist for both tangential and radial modes of instability. It was further shown that limit values of tangential velocity did exist, for a particular combustor, above and below which instability did not occur. Author (GRA)

N72-33960# Army Foreign Science and Technology Center, Charlottesville, Va.
TEMPERATURE STRESSES IN THIN VISCO-ELASTIC PLATES WITH HEAT EXCHANGE
Yu. M. Kolyano and M. V. Khomyak 4 Nov. 1971 13 p refs Transl. into ENGLISH from Inzh.-Fiz. Zh. (Minsk), v. 17, no. 5, Nov. 1969
(AD-745381; FSTC-HT-23-21-72) Avail: NTIS CSCL 20/11

Quasistatic problem of thermal visco-elasticity is solved for an infinite plate heated by a concentrated heat source, and dynamic problem of thermal visco-elasticity is solved for a semi-infinite plate suddenly heated on the edge. Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N72-33961 Engineering Sciences Data Unit, London (England).
ENGINEERING SCIENCES DATA UNIT TITLES THROUGH 1972
1972 28 p Sponsored by Roy. Aeron. Soc.
Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

The titles of all data items issued by Engineering Sciences Data Unit up to the end of 1971 are listed. The items appear in the following sub-series: aerodynamics, fatigue, performance, structures, and transonic aerodynamics. Author

N72-33962 Engineering Sciences Data Unit, London (England).
PROSPECTUS
[1972] 8 p Sponsored by Roy. Aeron. Soc.
Copyright. Avail: On subscription from Engineering Sciences Data Unit, 251-259 Regent Street, London W1R 7AD

A brief description is given of Engineering Sciences Data Unit services, the data items produced, and how to use the service, as well as the historical development of the Data Unit. The technical areas of interest are aeronautical engineering, mechanical engineering, chemical engineering, industrial fluid mechanics, and stress and strength. Author

N72-33963*# Brevard County Planning Dept., Titusville, Fla.
URBAN AND REGIONAL PLANNING Progress Report
John W. Hannah, Principal Investigator 2 Oct. 1972 1 p Sponsored by NASA
(E72-10146; NASA-CR-127331) Avail: NTIS HC $3.00 CSCL 13B

There are no author-identified significant results in this report.

N72-33964# National Research Council of Canada, Ottawa (Ontario).
QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT
30 Jun. 1972 108 p refs
(DME/NAE-1972(2)) Avail: NTIS HC $7.50

Research projects conducted by the National Research Council of Canada from 1 April to 30 June 1972 are discussed. Subjects presented include: (1) performance tests of fan in wing model for range of speeds and angles of attack, (2) methods for improving the aerodynamic stability of bridge road decks, (3) aerodynamic characteristics of SC1 and P-1127 aircraft, and (4) distribution of motor vehicle accidents among drivers. For individual titles, see N72-33965 through N72-33969.

N72-33965 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
GRADIENT COMPENSATION **c13**
C. D. Harduck *In* NRC of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 1-14 (For availability see N72-33964 24-34)

The problem caused by the earth magnetic field gradient in airborne magnetic anomaly detecting systems is discussed. A system to compensate for the gradient effects is described. The effects of aircraft maneuvers on the detection range of the magnetic anomaly detector is analyzed. Author

N72-33966 National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
FLOW DISTORTION AND PERFORMANCE MEASUREMENTS ON A 12 INCH FAN-IN-WING MODEL FOR A RANGE OF FORWARD SPEEDS AND ANGLE OF ATTACK SETTINGS **c12**
U. W. Schaub and R. W. Bassett *In its* Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 15-32 refs (For availability see N72-33964 24-34)

The performance of a typical fan-in-wing model was examined under representative transition conditions. The model, comprising a 12 in. diameter fan buried in a N.A.C.A 0015 section wing with a constant chord of 40 in., was tested at various angles of attack and air speeds in the closed working section of a propulsion wind tunnel. Tunnel interference corrections were estimated. Typical corrections were indicated for the whole testing range which became limited at very low crossflow ratios as a result of uncertainty in the correction in angle of attack. Flow distortion due to crossflow occurred in both the inlet and exit planes. In the crossflow ratio range zero to 0.27, inflow distortion was observed to be velocity distortion at essentially constant total pressure, whereas outflow distortion appeared to be a distortion of the exit plane static pressure field. The fan thrust was seen to fall off with crossflow ratios greater than 0.2 and appeared to be a direct result of increasing distortion. However, it seemed to be insensitive to relatively large changes in angle of attack. Input power measurements indicated little dependence on approach air speed or angle of attack. Author

N72-33967 National Aeronautical Establishment, Ottawa (Ontario). Low Speed Aerodynamics Lab.
SOME APPROACHES FOR IMPROVING THE AERODYNAMIC STABILITY OF BRIDGE ROAD DECKS **c32**
R. L. Wardlaw *In* NRC of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972

p 33-42 refs (For availability see N72-33964 24-34)

Some recent experiences in improving the aerodynamic stability of bridge road decks are reviewed. A recently completed cable-stayed bridge was observed to vibrate with amplitudes of 8 ins. Edge modifications devised in the wind tunnel have been installed on the bridge and there has been no further motion. By careful attention to edge geometry a high degree of stability has been achieved with a box section and a twin box section for a proposed new long span bridge. A cable-stayed bridge with a central box and cantilevered side spans is also discussed. The use of dynamic vibration absorbers is demonstrated analytically and in model experiments. Author

N72-33968 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.

FLYING EXPERIENCE WITH THE SC1 RESEARCH AIRCRAFT AND THE P1127 PROTOTYPE AT THE ROYAL AIRCRAFT ESTABLISHMENT, BEDFORD, ENGLAND c02

D. M. McGregor *In* NRC of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 43-66 refs (For availability see N72-33964 24-34)

Flight tests carried out with the SC1 jet-research aircraft (XG 905) and the P1127 prototype aircraft (XP 381) are discussed. Eight flights were conducted in the SC1 and four with the P1127. In addition, five in a Hunter T-7 were made before flying the P1127 to gain familiarity with the characteristics of high performance swept-wing aircraft. The purpose of the flying, from the NRC point of view, was to obtain experience on these two unique vertical take-off and landing (VTOL) aircraft while obtaining further pilot evaluations of their handling qualities. The aircraft are described with particular emphasis on the control systems, the trials undertaken and the handling qualities noted during this limited duration. Author

N72-33969 National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.

THE DISTRIBUTION OF MOTOR VEHICLE ACCIDENTS AMONG DRIVERS

G. F. W. McCaffrey *In* NRC of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Estab. 30 Jun. 1972 p 67-70 ref (For availability see N72-33964 24-34)

A numerical analysis of the distribution of motor vehicle accidents among drivers is presented. Semi-logarithmic plots of data are submitted for a sample of 7,842 drivers for a six year period. Exact plots of the data for various periods show the error involved in treating them as straight lines. The presentations have the effect of showing exact values for the distributions at zero and one accident and generally slightly pessimistic values for the percentages having two or more accidents in a period. Author

N72-33970*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

A SELECTIVE LIST OF ACRONYMS AND ABBREVIATIONS

Jul. 1972 186 p

(NASA-TM-X-68633; KSC-GP-589-Rev) Avail: NTIS HC $11.50 CSCL 05B

The third revision to the list of acronyms and abbreviations generally used at the John F. Kennedy Space Center is presented. It contains more than 9900 entries. Author

N72-33971*# Scientific Translation Service, Santa Barbara, Calif.

MAN AND TECHNOLOGY IN THE MASTERING OF SPACE

Yu. Novokshonov Washington NASA Sep. 1972 47 p refs Transl. into ENGLISH of "Chelovek i Tekhnika v Osvoyenii Kosmosa" Moscow, Znaniye Press, 1972 32 p

(Contract NASw-2035)

(NASA-TT-F-14522) Avail: NTIS HC $4.50 CSCL 05D

Some of the technical, scientific, and psychophysiological problems of the interaction between man and technology resulting from exploration and conquest of the universe are discussed. A general characterization of space technology is given, and the new and complex demands placed on man in exploring the universe are analyzed. Characteristic features of man's work activity in space and a number of aspects of the interaction, distribution, and mutual relationship between the functions of man and technology are described. Attention is given to the peculiarities of the automation of space technology in the present stage and in the future. Author

N72-33972# Federal Aviation Administration, Washington, D.C. Office of Management Systems.

TOWARD DEVELOPING AN IMPROVED CENTRAL FLOW MANAGEMENT SYSTEM

Richard Hakkarinen Oct. 1971 268 p

Avail: NTIS HC $15.50

The development and operation of a Central Flow Control Facility (CFCF) for balancing national aircraft flow in order to minimize delays to the users without exceeding controller capacity or jeopardizing safety are discussed. The concepts of flow management are presented in terms of: (1) scope, (2) purpose, (3) objectives of flow management system, and (4) concerns of flow management system. The Central Flow Computer Model for computer-based forecasting to provide status information on sectors or routes for any time period throughout the day of any day of the week is described. Author

N72-33973# Department of Transportation, Washington, D.C.

THE 1974 NATIONAL TRANSPORTATION STUDY. MANUAL 1: GENERAL INFORMATION

May 1972 71 p refs

(OMB-04-S-72004) Avail: NTIS

General information is provided to State and local government participants regarding the 1974 National Transportation Study. The manual contains two parts: an introduction to the study which describes the study and the information requests to be made of the States, and the Development of Work Program which describes the work program requested of each State for completing the study. Author

N72-33974# Committee on Science and Astronautics (U. S. House).

SCIENCE, TECHNOLOGY, AND THE ECONOMY

Washington GPO 1972 205 p refs Hearings before Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., no. 28, 11-13, 18, and 20 Apr. 1972

Avail: Subcomm. on Sci., Res., and Develop.

The hearings concerning the relation of science and technology to economic growth and prosperity are reported. Charts showing the structural changes in U.S. trade for selected years from 1969 to 1971, and comparative growth output per man hour in manufacturing for the U.S. and other industrialized nations are included. Discussions of the use of technology for solving social problems, government R and D, and R and D in the private sector are presented. F.O.S.

N72-33975*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

PUBLICATIONS OF THE JET PROPULSION LABORATORY: JANUARY THROUGH DECEMBER 1971

15 Oct. 1972 228 p refs

(Contract NAS7-100)

(NASA-CR-128378; JPL-Bibl-39-13) Avail: NTIS HC $13.50 CSCL 05A

Abstracts of the technical reports are presented alphabetically by author, and subject and publication indexes are provided. There are approximately 675 entries. N.E.N.

N72-33976# Southampton Univ. (England). Inst. of Sound and Vibration Research.

[ACTIVITIES OF THE INSTITUTE OF SOUND AND VIBRATION RESEARCH] Annual Report for the year

ending Mar. 1972
Mar. 1972 77 p refs
Avail: NTIS HC $6.00

The activities of the Institute of Sound and Vibration Research at the University of Southampton for the year ending March 1972, are reported. Sound and vibration measurement research was carried out in the fields of: turbomachinery, helicopter rotors, ducts and jets, buildings, automotive engineering, turbulent flow, aircraft noise, industrial aerodynamics, audiology, and structures. Author (ESRO)

N72-33977# Bonn Univ. (West Germany). Inst. fuer Gesellschafts- und Wirtschafts-wissenschaften.
THE DEVELOPMENT OF COMPUTERS. ANALYSIS AND FORECAST FOR DIFFERENT MARKETS [DIE ENTWICKLUNG DES COMPUTERBESTANDES - ANALYSE UND PROGNOSE FUER VERSCHIEDENE MAERKTE]
H. Jungemann Bad Godesberg, West Ger. Bundesmin. fuer Bildung und Wiss. Apr. 1972 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMBW-FB-DV-72-01) Avail: NTIS HC $5.75; Zentralstelle fuer Atomkernenergie-dokumentation (ZAED), Leopoldshafen, West Ger., 79 DM

An extended logistic function is used to describe the extension of the number and value of installed computers in Germany. The level of saturation is defined as a function of the gross national product. The average relation between price and effectiveness has been added as an additional exogenous parameter. The effectiveness is determined by technical basis (internal speed of calculation, capacity of internal storage, etc), whereas the average monthly rental price is taken as a measure of the price for each type of computer. Analysis and forecast is made for the number and value of all installed computers in Germany and separately for the market-leader (IBM). By defining partial elasticities of price and effectiveness the market behavior is clarified. A corresponding investigation is made for the number and value of all computers of U.S.-based computer firms and seperately for those of the market-leader (IBM). Author (ESRO)

N72-33978# European Space Research Organization, Paris (France). Space Documentation Service.
ESRO DATABANK: CLASSIFICATION SCHEME FOR ELECTRONIC COMPONENTS
Nov. 1970 43 p Revised
(ESRO-PSS-08/SDS-01-Rev-0) Avail: NTIS HC $4.25

The ESRO classification scheme for electronic components was developed for use with data files maintained and processed using automatic data processing equipment. The scheme, which will be subject to periodic amendment and extension, currently covers twenty-one classes of electronic component. An eight-digit numerical code is used to identify the most specific electronic component description, the first four digits being identical with the four digit NATO classification code. Four levels are used within the classification structure: component group, class, category, and specific product name. The generic component names draw heavily on the procedures established in developing item names within NATO description patterns. A companion document will be issued listing ESRO Standard Product Data Patterns. These SPDs define for each specific component, the data elements (physical and performance characteristics, etc.) required for the creation of a complete databank product record. Author (ESRO)

N72-33979# European Space Research Organization, Paris (France). Space Documentation Service.
ESRO DATABANK: STANDARD PRODUCT DATA PATTERNS FOR ELECTRONIC COMPONENTS (SPDP)
Jun. 1971 162 p
(ESRO-PSS-12/SDS-02(HQ)) HC $10.25

The ESRO classification scheme for electronic components has been developed for use with data files maintained and processed using automatic data processing equipment. The scheme provides a defined input requirement termed a Standard Product Data Pattern, for each specific component within scope. SPDPs define the data element (physical and performance characteristics, etc.) required for the creation of a complete databank product record; they are used in conjunction with the data preparation manual in the preparation of input data. The manual will be issued later as a companion document. Author (ESRO)

N72-33980# Arctic Inst. of North America, Washington, D.C.
ARCTIC LOGISTICS SUPPORT TECHNOLOGY
Beverly F. Slocum, ed. May 1972 385 p refs Proc. of symp. held in Hershey, Pa., 1-4 Nov. 1971; sponsored by ONR and ARPA
(Contract N00014-70-A-0219-0003; NR Proj. 307-347)
(AD-744669) Avail: NTIS CSCL 15/5

The report documents the proceedings of a symposium on arctic logistics support technology held at Hershey, Pennsylvania on November 1-4, 1971. Thirty-one papers were read at the symposium, and all are included in this report. The papers fall into three broad subject areas: transportation, life support, and activity support (for special needs of field investigators). Although the papers focus on particular ARPA needs, the information they contain should prove helpful to other groups and individuals either engaged in, or planning for, research in arctic regions. Author (GRA)

N72-33981# Teledyne Systems Co., Northridge, Calif.
GROUND/AIR DETECTION SYSTEM (GADS) Final Technical Report
Gunter Hensel and Richard W. Carman Griffiss AFB, N. Y. RADC Mar. 1972 128 p
(Contract F30602-67-C-0366; AF Proj. 3302)
(AD-743307; TSC-295; RADC-TR-72-50) Avail: NTIS CSCL 17/7

GADS is a system capable of detecting, analyzing, and transmitting to air interrogating aircraft information concerning the number, direction, and speed of vehicles and/or people passing along trails and roads. System development was carried out in two phases. A hand-emplaced version was developed and subsequently tested in a hostile environment of the Panama Canal Zone with excellent results, i.e., feasibility of GADS concept was clearly demonstrated. The second phase of this program consisted of modifying this system to an air-deployed version. Due to schedule and budget limitations, only a minimal effort was carried out to develop an airborne version of GADS, and for this reason some of the minor problems encountered could not be carried to a totally satisfactory conclusion. Author (GRA)

N72-33982# Pittsburgh Urban Transit Council, Pa.
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON URBAN TRANSPORTATION (5TH). MOBILITY: THE FIFTH FREEDOM Final Report
Sep. 1971 223 p Conf. held at Pittsburgh, 8-10 Sep. 1971; sponsored by DOT and Carnegie-Mellon Univ.
(PB-208972; UMTA-UPA-71-5) Avail: NTIS HC $3.00 CSCL 13F

The report lists the proceedings of a conference on urban transportation including the speakers and their addresses. GRA

N72-33983# George Washington Univ., Washington, D.C.
LAWS AND REGULATORY SCHEMES FOR NOISE ABATEMENT
31 Dec. 1971 643 p refs
(Contract EPA-68-04-0032)
(PB-206719; EPA-NTID300.4) Avail: NTIS HC $9.00 CSCL 13B

The report presents results from surveying the existing Federal, State, and local laws, ordinances, and regulations governing the abatement and control of environmental noise. This basic assignment was divided into four subtasks: current

governmental noise regulatory schemes; analysis of existing legal regulatory structure for noise abatement and control; the effectiveness of existing noise control regulation; and proposals and problems in the regulation and abatement of noise.

Author (GRA)

N72-33984# Environmental Protection Agency, Washington, D.C.

REPORT TO THE PRESIDENT AND CONGRESS ON NOISE

31 Dec. 1971 468 p refs

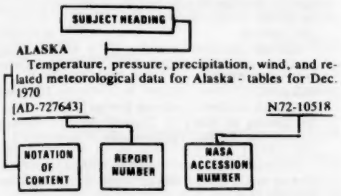
(PB-206716; EPA-NRC500.1) Avail: NTIS HC $6.00 CSCL 13B

The report reviews the effects and abatement of noise on society. The contents include the following topics: effects of noise on living things and property; sources of noise and their current environmental impact; control technology and estimates for the future; laws and regulatory schemes for noise abatement; government, industry, professional and voluntary association programs; and an assessment of noise concern in other nations.

GRA

SUBJECT INDEX

TYPICAL SUBJECT INDEX LISTING



The subject heading is a key to the subject content of the document. The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The NASA accession number denotes the number by which the citation is identified. The NOC's are arranged under each subject heading in ascending accession number order.

A

A-6 AIRCRAFT
Performance tests of A-6 aircraft during landing arrestment evaluation at high gross weight for two thousand arrestments
[AD-745300] N72-33049

ABERRATION
Design of spectrographic cameras based on Maksutov lens system emphasizing aberration
N72-33401

ABLATION
Transient heat conduction computer program for two-dimensional, axisymmetric bodies including general description of program capabilities and sample problems
[AD-744853] N72-33956

ABLATIVE MATERIALS
Flight and arc heated wind tunnel tests of very low density silicone-phenolic composite ablative material
[NASA-TN-D-6956] N72-33946

ABSORPTION SPECTRA
Advances in astronomical spectroscopy noting grating Coude spectrographs, Fabry-Perot interferometers and spectrometers
N72-33390
High resolution Michelson interferometry in visible spectrum for interstellar absorption
N72-33423
Laser coincidence absorption measurements for long path monitoring of gaseous pollutant in urban atmosphere
[PB-210671] N72-33627
Microwave absorption and emission spectra of OH, CH, SO2 HCN, H2CS, NH2CHO, and CH3CHO
[RR-109] N72-33760
Pulsar pulse dispersions and low frequency absorption of galactic and extragalactic radio sources for interstellar medium study
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ACCELERATION [PHYSICS]
Dynamics of acceleration of drive for mockup of drill press table with programmed control
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Effects of velocity and acceleration on pressure distribution around sphere in unsteady flow
[AD-745026] N72-33289

ACCIDENT INVESTIGATION
Accident investigation of Southern Airways, Inc. DC-9 N97S crashing at Tri-State Airport, Huntington, West Virginia on 14 Nov. 1970
[PB-209082] N72-33052

ACCURACY
Accuracy of aerial photogrammetric triangulation
N72-33459

ACOUSTIC DUCTS
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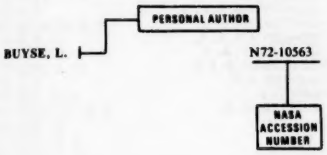

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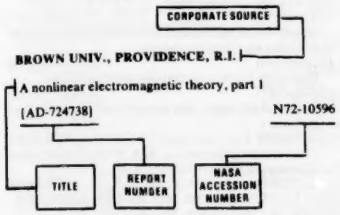

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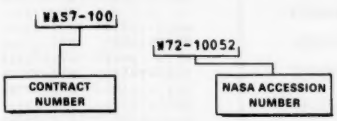

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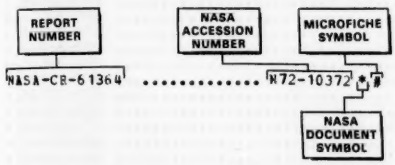

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